IBM Office Products Division
Customer Engineering

SERVICE MANUAL

"SELECTRIC" I/O TYPEWRITER

IBM "Selectric" I/O Typewriter

Form No. 241-5737-0
July, 1973

1-10-77.

BCD Type ball 1167908
1167908

"SELECTRIC" INPUT/OUTPUT TYPEWRITER SERVICE MANUAL CONTENTS (ALPHABETICAL)

Carolyn Wheelock Catalogs
545-2223

Type Catalog #241-5687

1.65 + Tax

NOT 5103
" 5939
" 5615
" 5687

input/output "Selectric" Typewriter
Yellow-Parts Catalog #241-5157
Yellow-price list 241-5158

PREFACE

This manual was published to be used by Customer Engineers and other technically oriented individuals as a reference source to aid in servicing the IBM "Selectric" Input/Output Typewriter. This manual covers the IBM "Selectric" Input/Output Typewriter Models 74X, 73X and 775 and was written with the restraint that the persons using the manual will already be familiar with the machine from the operator's viewpoint.

The IBM "Selectric" Input/Output Typewriter Parts Catalog and the Pictorial Reference/Adjustment Manual are recommended to be used in conjunction with this manual. There are four special tools that are also required to service the "Selectric" Input/Output Typewriter. They are the Hooverometer, platen gauge, volt/ohm meter, and hand cycling wheel. The use of the Hooverometer and platen gauge are self-evident in the adjustments that require their use. The hand cycling wheel fits into the right end of the operational shaft and is used to operate the machine by hand to view an adjustment or the mechanism operation. The hand cycling wheel should be turned top to front. The volt/ohm meter is used to establish timing relationships.

The Introduction section of the manual includes the function of the machine, applications of the product line and any unique features or functions of the equipment.

The Functional Check section is outlined in a sequence so that all major functions of the machine are checked for proper performance. However, this check does not necessarily follow the sequence of operational theory adjustments within the manual. The use of the functional check cannot be stressed too strongly and should be used after any service has been performed on the equipment.

The Mechanism sections of the manual are divided into two parts: Operational Theory and Adjustment. The Operational Theory part of a section contains an explanation and illustrations in detail of how that particular mechanism operates. When it is required, the view, the model of machine, level of design, and mode or condition of the equipment is noted under the illustration. In the Adjustment part of the section, each adjustment is written and illustrated in the sequence that the adjustments are to be made. When an adjustment is made, all adjustments that follow in that mechanism must be checked to ensure the adjustment did not affect an adjustment later in the sequence. The part to be adjusted, as well as the direction the part must be adjusted, are printed in red. When required, the view, the model of machine, level of design, and mode or condition of the equipment is noted under the illustration. There may be instances where adjustment sequences or tolerances vary from those set forth in other related publications, however, the publication bearing the latest date should normally be considered the most current.

The Removal Procedures section is a numbered sequence of instructions for part removals when a detailed part by part removal instruction is needed. Reassembly is accomplished by reversing the removal steps. If a detailed breakdown of an assembly is needed, the illustrations in the Parts Catalog should be used.

INTRODUCTION

The IBM "Selectric" Input/Output (I/O) Typewriter is designed to incorporate the customer's or IBM's electrical hardware to interconnect with an electronic device.

The IBM "Selectric" Input/Output Typewriter is available with film or fabric ribbon and features a small sphere-shaped typing element that replaces typebars and thus eliminates type clashing. The typing element is easily removed to permit changing the typestyle to best suit the application. An impression control permits the operator to vary the impression of the typing element. A stroke storage mechanism reduces typing errors by storing the second of two rapidly typed characters until the first is printed out. The paper mechanism remains stationary and the element moves across the paper.

The applications of the I/O are to: Input - transmit data to an electronic device; Output - receive data from an electronic device: or perform both input and output functions. I/O applications also include all types of general correspondence, preparation of master copy for most types of duplicating, carbon copies, stencil writing, and formswriting. The machine is available with minor changes in the element, keyboard, and cardholder for Optical Character Recognition applications.

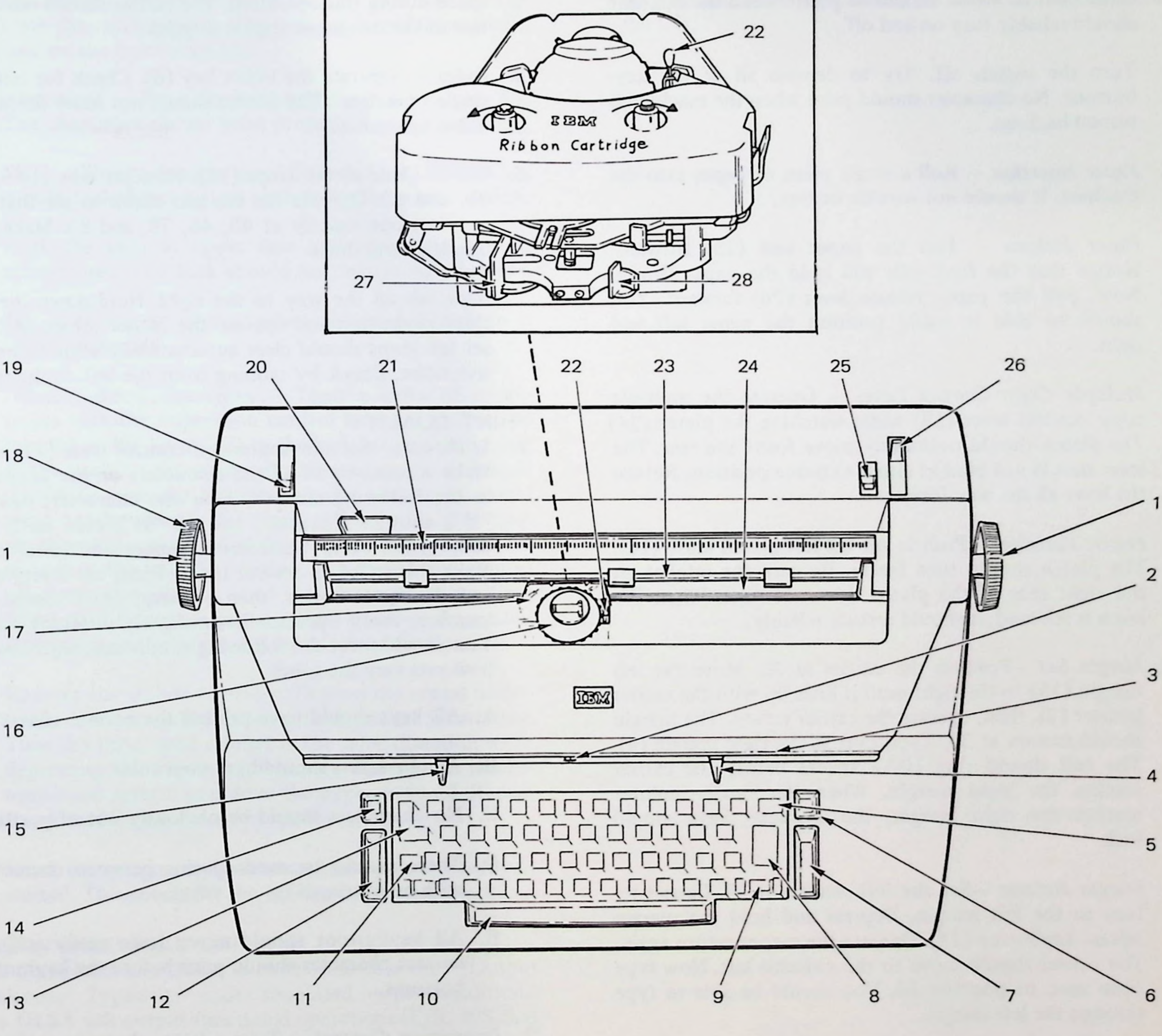
FUNCTION CHECK

This functional check is a procedure that will tell you whether or not an IBM Input/Output "Selectric" Typewriter has any malfunctions. It includes checks of every function of the machine, organized in an efficient sequence. The functional check is divided into three parts; off-line, OLSA check, and on-line.

Off-Line – The off-line check can be performed with power to the motor only. This condition may be obtained by disconnecting the cable connector from the I/O. Many electronic devices have the ability to present the I/O in an off-line condition.

OLSA Check – This part of the check is done with the OLSA or OLSA-T (Off-Line "Selectric" Analyzer).

On-Line – The on-line check is performed with the I/O connected to its electronic device.



1. Platen Knob
2. Position Indicator (Carrier Pointer)
3. Front Scale
4. Right Margin Stop
5. Backspace Key
6. Index Key
7. On/Off Switch
8. Carrier Return Key
9. Shift Key
10. Spacebar
11. Shift Lock
12. Tab Set/Clear
13. Tab Key
14. Margin Release Lever
15. Left Margin Stop
16. Typing Element (Typehead)
17. Clear View Cardholder
18. Platen Variable
19. Multiple Copy Control
20. Paper Guide
21. Copy Guide Scale
22. Impression Control
23. Paper Bail
24. Platen
25. Line Space Lever
26. Paper Release Lever
27. Ribbon Lift Lever
28. Ribbon Load Lever

OFF-LINE FUNCTIONAL CHECK

NOTE EXISTING MARGIN SETTINGS AND TAB LOCATIONS SO THEY MAY BE RESET AT THE CONCLUSION OF THE FUNCTIONAL CHECK.

OPERATOR CONTROLS

1. *Visual Inspection* – Look at the machine carefully for any obviously loose, damaged, or missing parts. Also look for foreign material in the machine: pencils, erasers, paper clips, etc.

2. *On-Off Switch* – Operate the on-off switch (7) several times. Switch action should be positive and the machine should reliably turn on and off.

   Turn the switch off. Try to depress all of the keybuttons. No character should print when the machine is turned back on.

3. *Paper Insertion* – Roll a single piece of paper into the machine. It should not wrinkle or tear.

4. *Paper Release* – Pull the paper bail (23) forward. Notice that the feed rolls still hold the paper firmly. Now, pull the paper release lever (26) forward. You should be able to easily position the paper left and right.

5. *Multiple Copy Control Lever* – Operate the multiple copy control lever (19) while watching the platen (24). The platen should noticeably move front and rear. The lever should not bind at either extreme position. Return the lever all the way forward.

6. *Platen Variable* – Push in on the left platen knob (18). The platen should turn freely. Be sure the ratchet on the right side of the platen does not turn. When the knob is released, it should restore reliably.

7. *Margin Set* –Position the carrier at 30. Move the left margin (15) to the right until it lines up with the carrier pointer (2), then, operate the carrier return. The margin should remain at 30. Type over to the right margin (4). The bell should ring 10-12 spaces before the carrier reaches the right margin. When the carrier pointer reaches the right margin, the character keys should lock.

8. *Margin Release* –Set the left margin at 25. Carrier return to the left margin. Depress and hold the margin release keybutton (14). Operate the carrier return again. The carrier should move to the extreme left. Now type from zero to position 30. You should be able to type through the left margin.

CARRIER MOVEMENT

1. *Spacebar* – Return the carrier to the left margin. Check the spacebar by first typing a series of lower case "n's" separated by a space. Then, return to the margin, roll back to the same writing line and substitute a space for the "n's" and the letter "x" for the space. You should have a line of alternate "n's" and "x's" evenly spaced.

2. *Backspace* – Turn the paper in your machine sideways; then starting with the machine 10 spaces from the extreme right margin, type a row of "h's" and "n's" alternately for a total of ten characters. Now, backspace 10 spaces and retype the same characters. The characters should overlay each other.

   Also, Check the backspace in a similar manner with the carrier positioned at 10 and 60 on the front scale.

3. *Carrier Return* – Operate the return key (8) with the carrier positioned two, three and four inches from the left margin. Check for reliable single and double line-space during this operation. The carrier should not hesitate at the margin or appear sluggish.

4. *Index* – Operate the index key (6). Check for reliable single operation. The carrier should not move during an index operation.

5. *Tab* – Clear all tab stops (12). Now set tabs at 45, 46, 78, and 80. Operate the tab and check to see that the carrier stops exactly at 45, 46, 78, and 80. Make this check several times.

   Now tab all the way to the right. Hold down the tab clear keybutton and operate the carrier return. All the set tab stops should clear automatically without excessive noise. Check by tabbing from the left to the right.

PRINT QUALITY

1. *Strike-up* – Set the impression control lever (22) at 3. Make a strike-up of all the characters on the keyboard in the following manner: type one character, then an "H"; another character, and an "H", etc., until you have typed every character in upper and lower case. Make this strike-up several times. First, use a very slow and deliberate touch, then a heavy, rapid touch. Remember, every operator has a slightly different touch. You should meet the following conditions, regardless of how you vary the touch.

   A. All keys should have printed the correct character.

   B. All characters should have even color.

   C. No characters should be obviously out of position.

   D. There should be even spacing between characters with no overlap.

   E. All keybuttons should move down easily and the correct character should print before the keybutton bottoms.

2. *Impression Control* – Type a letter character with the impression control lever at 1 and then at 5. You should hear a noticeable difference in the sound of the typehead (16) hitting the paper. Return the impression control lever to 3.

3. *Linespacing* – Type several lines of underscores in both linespace lever (25) positions. The space between the typed lines should be even for both linespace lever positions.

4. *Scales* – Type a line of upper case V's. The horizontal line on the card holder (17) should be parallel to the line of V's.

   The points of the V's should line up with the vertical lines on the card holder.

   Set the left margin as far to the left as it will go. Operate the carrier return. The pointer should line up with zero on the front scale (3).

5. *Alignment* – Type alternate upper and lower case Z's. The characters should print properly with even spacing.

6. *Shift* – Slowly depress the shift lock (11). The button should lock down just as or slightly after a shift occurs.

   Lock the shift in upper case and type a full line of underscores. The lock should not release by vibration.

   The shift should unlock when either shift button is lightly depressed.

7. *Fabric Ribbon Operation* – Type a series of underscores with the impression control lever set on five and the ribbon lift lever (27) in the high lift position. Look at the position the underscore printed on the ribbon. It should be near the bottom and all underscores should print on the ribbon. If a black and red ribbon is used, all characters must print black when the ribbon lift lever is in the low lift position, and all characters must print red when the lift lever is in the high lift position. When the lift lever is in the stencil position, the underscore must not print on the top of the ribbon.

   Remove the ribbon cartridge. Depress the repeat underscore and note which ribbon feed ratchet is rotating. Turn the other feed ratchet in the same direction while depressing the repeat underscore. The ribbon mechanism must reverse and drive the opposite spool. Repeat the procedure for the other spool.

   Reset the margins and tab stops as they were when you started. This concludes the off-line functional check.

OLSA FUNCTIONAL CHECK

The purpose of the OLSA is to test the IBM Input/Output "Selectric" Typewriter under simulated output conditions. The OLSA will output functional operations (C/R, B/S, S/B, etc.) and character operations by utilizing the I/O's internal circuitry in a manner similar to the electronic device to which it is normally connected. It may be used as an aid in testing machines after mechanical or electrical repairs have been performed. The OLSA may also be used as a diagnostic aid in cases where it is not apparent whether the problem is in the I/O or the electronic device.

There are two levels of OLSA's, which are identified as OLSA (level 1) and OLSA-T (level 2). The OLSA-T has increased capabilities, and it's use is recommended to obtain a more comprehensive check of the I/O. The OLSAs can easily be identified by the carrying case. The OLSA is in a brown case and the OLSA-T is in a black case.

ON-LINE CHECK

Many electronic devices have the ability to supply an I/O exercise. Proper I/O response to this exercise should be obtained from the operator or technician that is involved with the electronics device. This exercise may be useful in determining the compatability of the electronics device and the I/O.

MOTOR & DRIVE OPERATIONAL THEORY

The motor and drive mechanism (Figure 1) supplies power to drive the cycle shaft and the operational shaft. The motion to operate the mechanisms within the "Selectric" I/O typewriter is obtained through the various cams and gears which are driven by these two shafts.

There are two types of motors used, "Capacitor Start" and "Shaded Pole". In both cases the motor is located in the left rear corner of the machine.

The capacitor start motor utilizes a fixed motor pulley and the shaded pole motor utilizes a centrifugal motor clutch to provide drive to a cogged drive belt. The drive belt drives the cycle clutch pulley which in turn drives both the operational shaft and the cycle shaft.

The switch and switch lever are mounted on the right front side of the keyboard (Figure 1). The switch lever operates a switch by means of a short link extending to the rear.

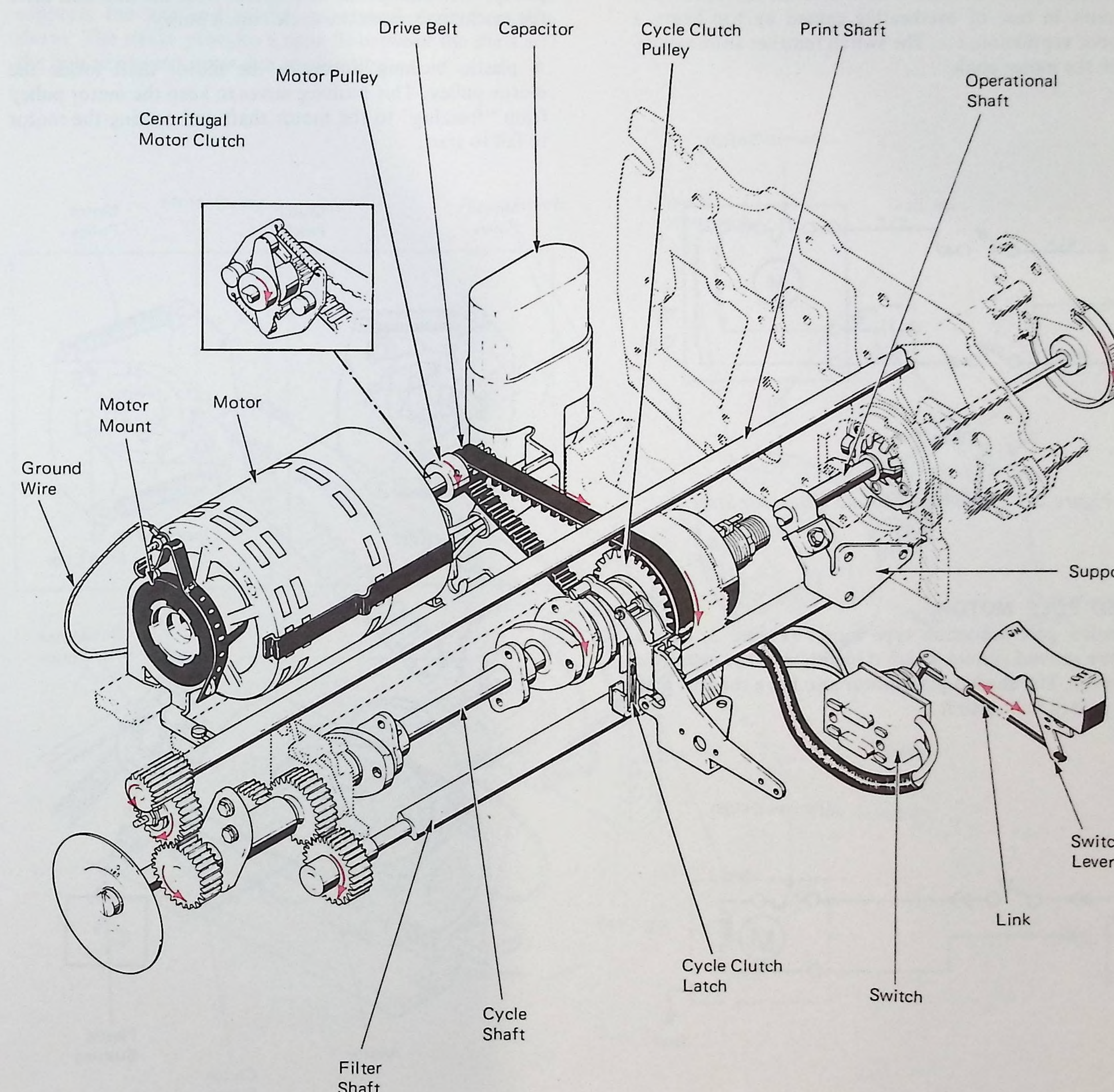


Figure 1 – Drive Mechanism

MOTOR & DRIVE OPERATIONAL THEORY

The motor and drive mechanism (Figure 1) supplies power to drive the cycle shaft and the operational shaft. The motion to operate the mechanisms within the "Selectric" I/O typewriter is obtained through the various cams and gears which are driven by these two shafts.

There are two types of motors used, "Capacitor Start" and "Shaded Pole". In both cases the motor is located in the left rear corner of the machine.

The capacitor start motor utilizes a fixed motor pulley and the shaded pole motor utilizes a centrifugal motor clutch to provide drive to a cogged drive belt. The drive belt drives the cycle clutch pulley which in turn drives both the operational shaft and the cycle shaft.

The switch and switch lever are mounted on the right front side of the keyboard (Figure 1). The switch lever operates a switch by means of a short link extending to the rear.

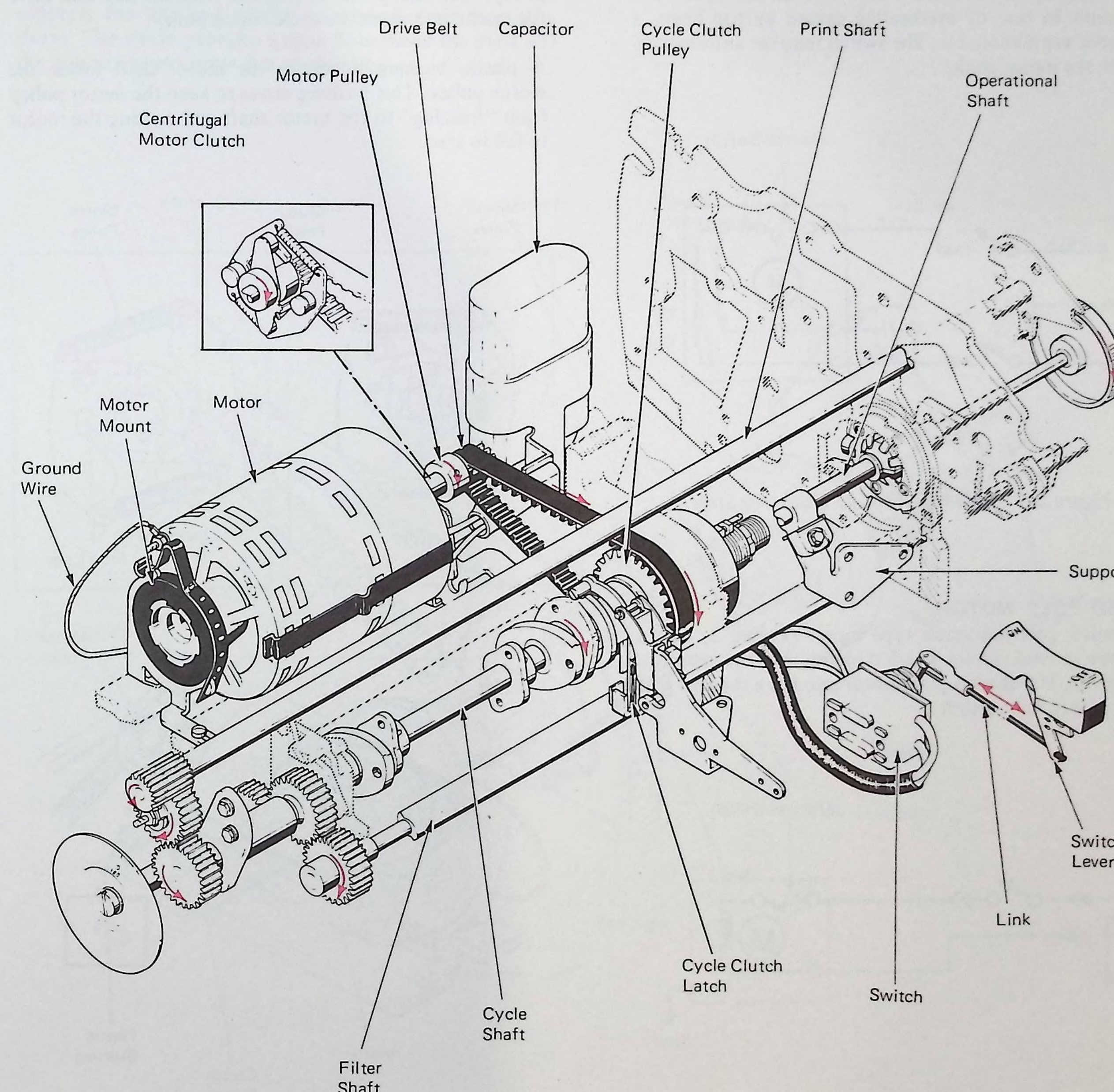


Figure 1 – Drive Mechanism

CAPACITOR START MOTORS

The "Selectric" I/O typewriter uses a three-wire grounded system (Figure 2). In addition to the line cord ground, a short jumper wire is used to ground the motor to the power frame. A second jumper wire is used to connect the power frame to the covers. The capacitor is grounded to the power frame through its mounting screws.

The capacitor is in the start winding circuit and provides a starting torque for the motor and controls the direction of rotation.

A thermally operated switch is built into the motor to open the circuit in case of overheating caused by too heavy a load, poor ventilation, etc. The switch remakes automatically when the motor cools.

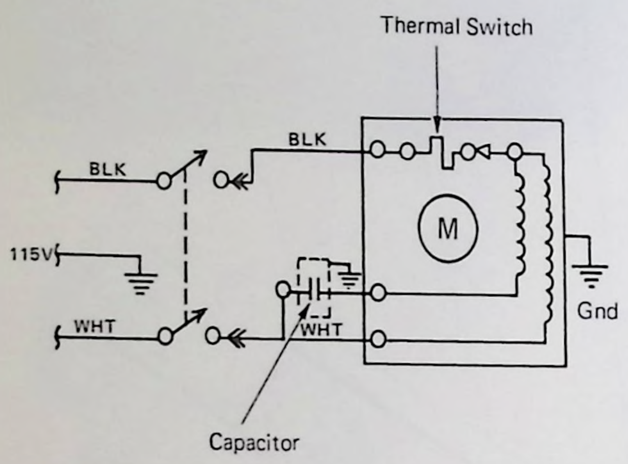


Figure 2 – Three-Wire Ground Capacitor Start

SHADED POLE MOTOR

The shaded pole induction type motor (Figure 3) uses a three-wire ground system which is identical to the capacitor start motor. The shaded pole motor also has a thermal protection switch built into it.

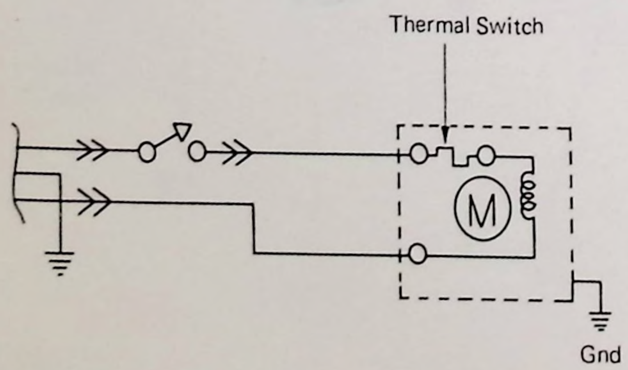


Figure 3 – Three-Wire Switch – Shaded Pole

MOTOR CLUTCH

Due to the low starting torque of the shaded pole motor, a motor pulley clutch (Figure 4) is needed. This allows the motor to attain operating speed before it engages the load.

A clutch pulley hub is setscrewed to the shaft of the motor just to the left of the motor pulley. Two clutch pawls pivot on the clutch pulley hub (Figure 4). When the motor is "OFF", the pawls are spring loaded against stop lugs on the hub. When the motor is turned "ON", centrifugal force causes the clutch pawls to pivot on the hub so the tip of one of the two pawls will engage a tooth on the motor pulley. The pulley will then rotate with the hub and drive the machine through the cycle clutch pulley.

A plastic bushing surrounds the motor shaft inside the motor pulley. This bushing serves to keep the motor pulley from "freezing" to the motor shaft and causing the motor to fail to start.

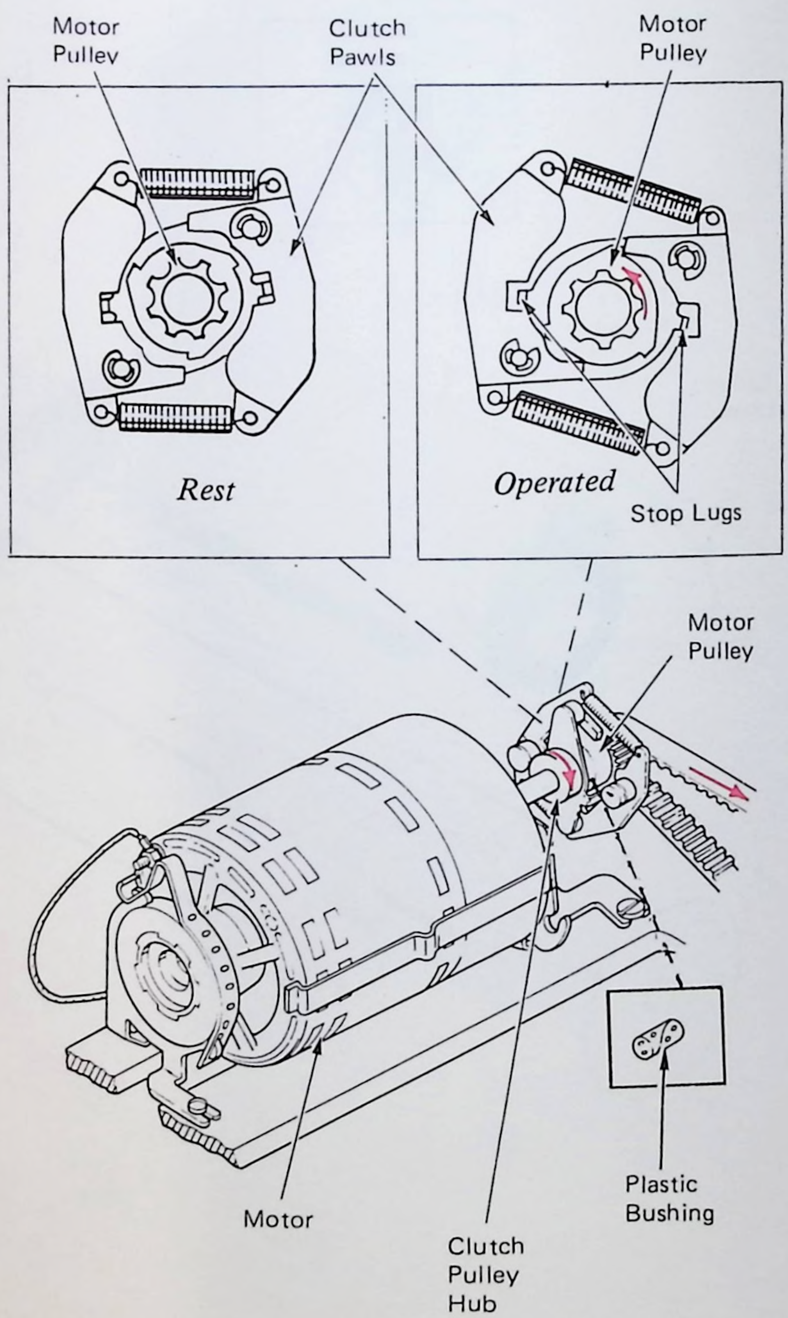


Figure 4 – Motor Clutch

OPERATIONAL SHAFT DRIVE

The cycle clutch pulley (Figure 5) is setscrewed to a hub in the center of the power frame. Two setscrews are used, one on top of the other. The top screw provides a locking action to prevent loosening of the pulley. The hub and pulley, supported by a porous bronze bearing, rotate continuously with the motor pulley whenever the motor is running.

The cycle clutch pulley hub supports two shafts. The shaft on the right, called the operational shaft (Figure 5), is in constant rotation with the cycle clutch hub. All functional operations (tab, spacebar, backspace, carrier return, index and shift) are driven by this shaft. The cycle clutch hub supports the left end of the operational shaft through a sleeve. The sleeve provides a snug fit between the shaft and the hub to prevent noise due to vibration.

The driving connection between the cycle clutch pulley hub and the operational shaft is made by two extensions of the pulley hub that fit into cutouts in the left side of the torque limiter hub. The torque limiter hub is setscrewed to the operational shaft to complete the driving connection. Two nylon inserts fit into the cutouts to provide a noiseless driving connection between the two hubs.

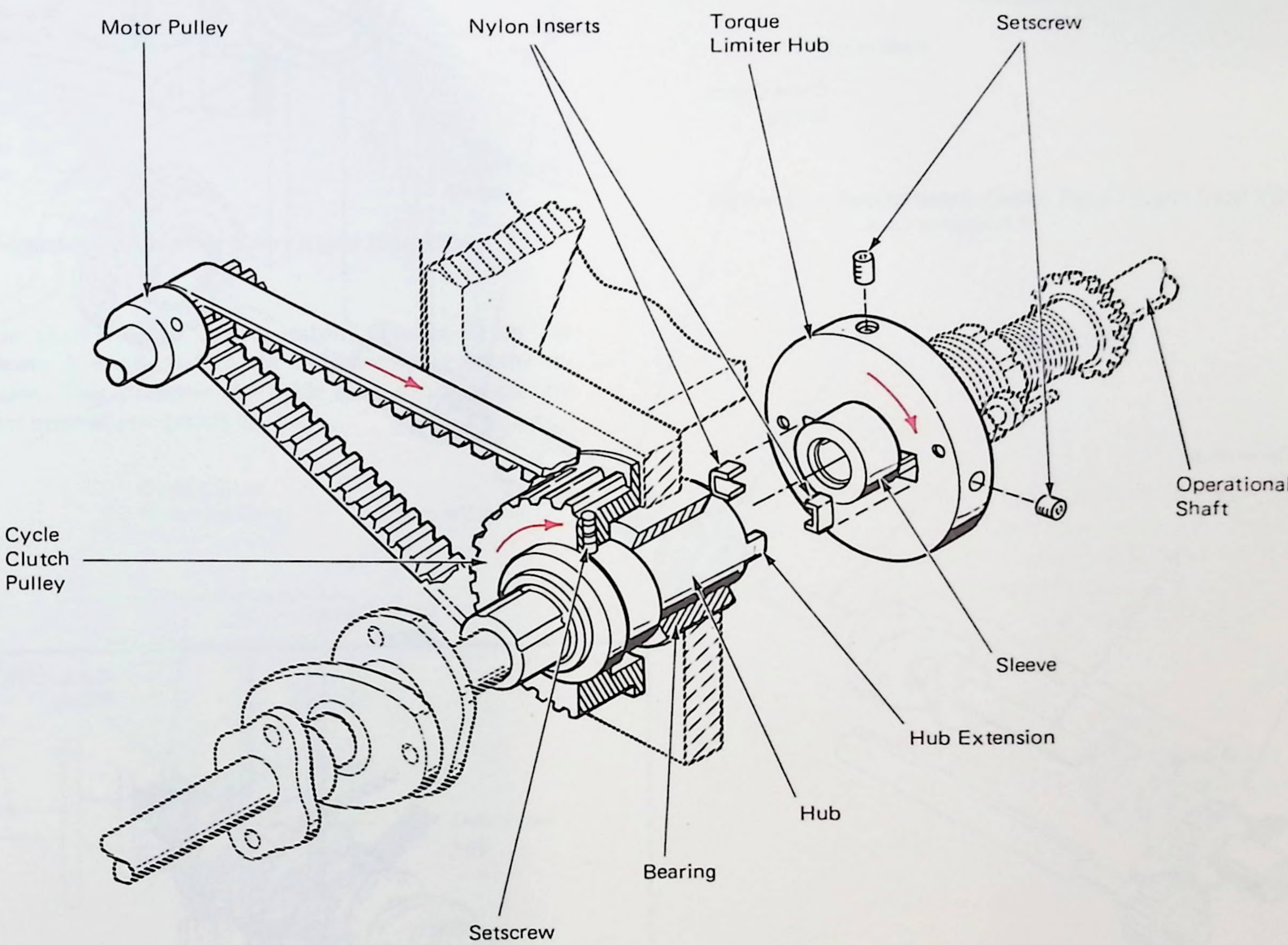


Figure 5 – Operational Shaft Drive

CYCLE SHAFT AND CLUTCH

The shaft to the left of the cycle clutch pulley is called the cycle shaft (Figure 6). All print operations: e.g., Character Selection (Input and Output), Detenting, Ribbon Control, receive their motion from this shaft. Each time a print operation is initiated, the cycle shaft will be driven 180 degrees.

The cycle clutch assembly establishes the driving connection between the cycle clutch pulley hub and the cycle shaft (Figure 6). The actual driving link is the cycle clutch spring. The left end of the spring is clamped to the driven arbor on the cycle shaft by the cycle clutch collar. The right end of the spring fits over the driving arbor on the cycle clutch pulley hub. The cycle clutch sleeve fits loosely over the cycle clutch spring and traps the right hand lug in a slot on the sleeve.

The cycle clutch is controlled by the cycle clutch latch and cycle clutch sleeve. As a print operation is initiated, the cycle clutch latch will be withdrawn from a step on the sleeve, allowing the sleeve and cycle clutch spring to rotate until the cycle clutch spring wraps tightly onto the rotating drive arbor. The connection between the cycle clutch pulley and the cycle shaft is now established and the cycle shaft will rotate.

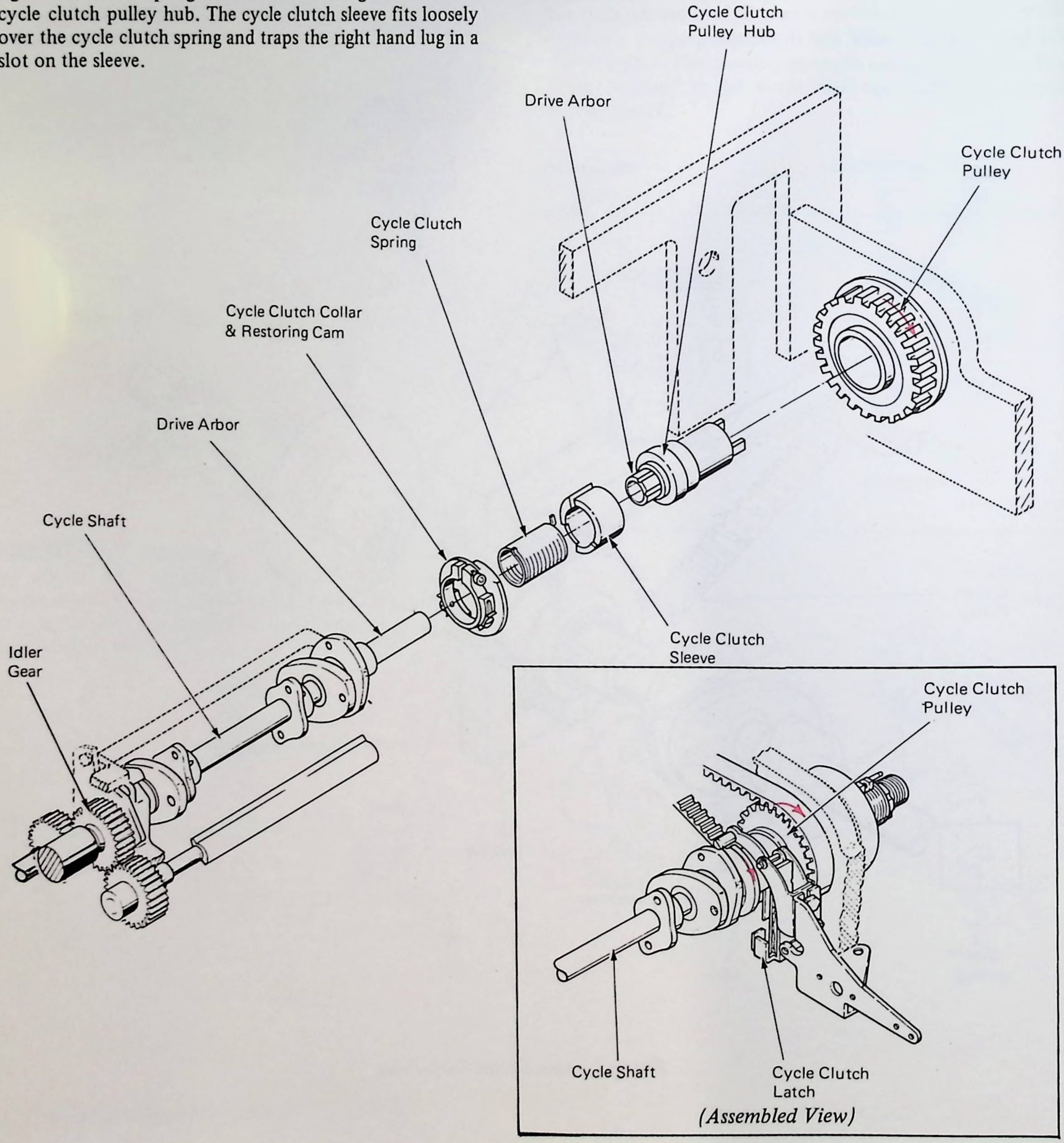


Figure 6 – Cycle Shaft And Clutch

CYCLE CLUTCH RESTORING

At 90 degrees through cycle clutch operation the restoring cam (Figure 7) contacts the restoring roller which positions the cycle clutch latch in the path of the next step on the cycle clutch sleeve. When the cycle clutch sleeve contacts the cycle clutch latch, the cycle clutch sleeve and cycle clutch spring stop rotating. Due to the inertia, the cycle shaft continues to rotate. This causes the cycle clutch spring to open, breaking the driving connection between the cycle clutch pulley and the cycle shaft.

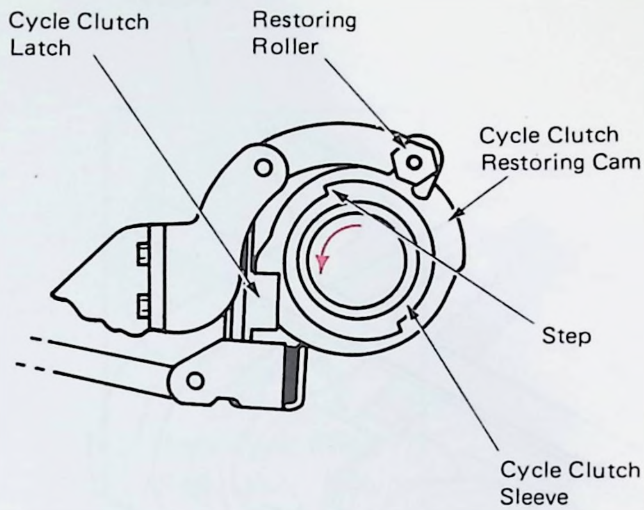


Figure 7 – Restoring Cam (Right Side View)

The cycle shaft rotates until a cutout (Figure 8) on the clutch sleeve is contacted by an overthrow lug on the restoring cam. This prevents the cycle shaft from advancing beyond its normal rest position.

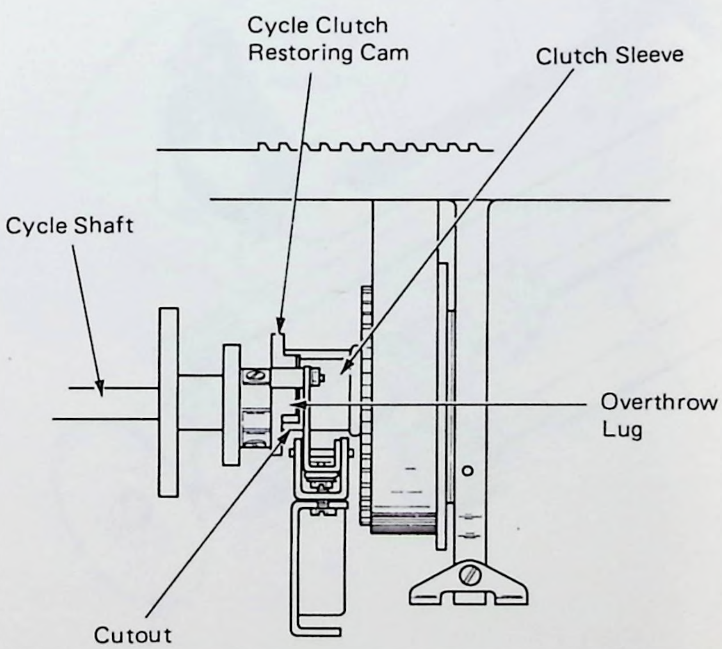


Figure 8 – Cycle Clutch Overthrow (Top View)

As the cycle clutch is stopped, the cycle clutch check pawl located near the left end of the cycle shaft (Figure 9) engages the cycle clutch check ratchet. This prevents the cycle shaft from rebounding backwards. The cycle shaft is now in its rest position.

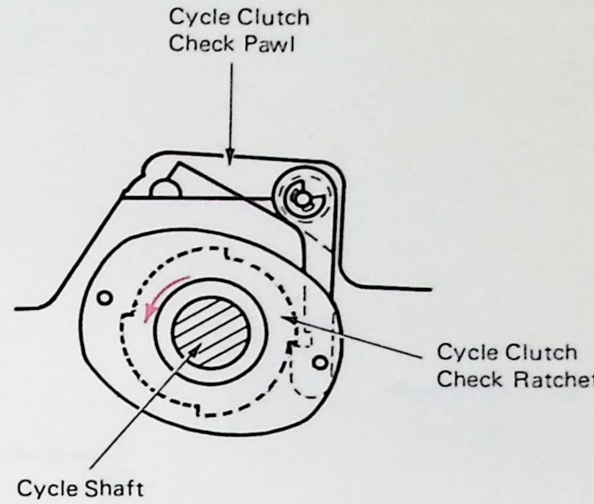


Figure 9 – Cycle Clutch Check Pawl (Right Side View)

GEAR TRAIN

The cycle shaft gear (Figure 10) which is setscrewed to the end of the cycle shaft, drives the lower and upper idler gears. The idler gears in turn deliver motion to the filter shaft and print shaft through their respective gears. These shafts deliver motion to the keyboard and the carrier during each print cycle.

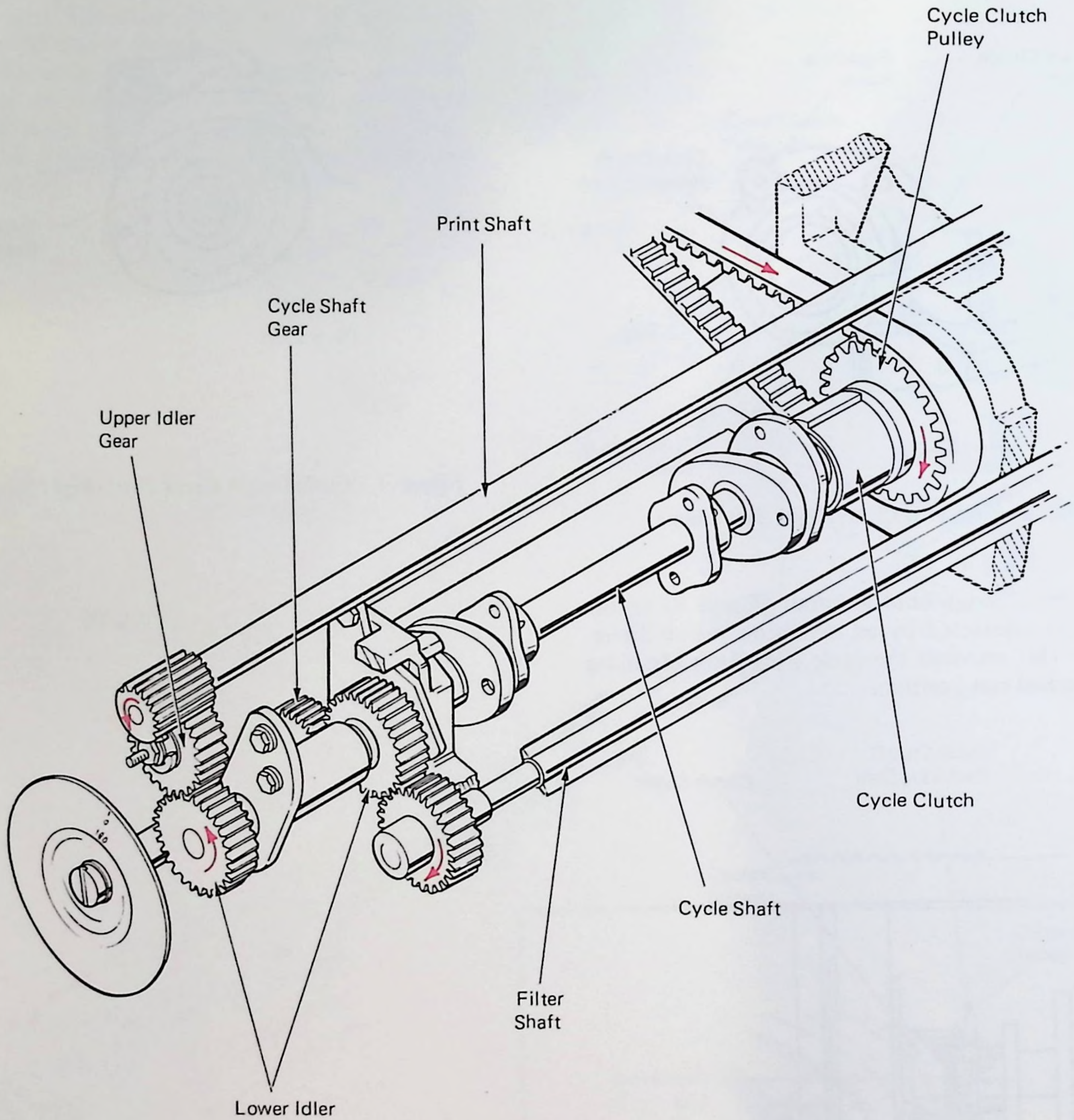


Figure 10 – Gear Train

HAND CYCLING

Hand cycling is accomplished through the use of the Hand Cycle Wheel (Figure 11). The Hand Cycle Wheel attaches to the right end of the operational shaft and is used to manually apply rotational motion to the drive mechanism.

When the I/O is to be hand-cycled, the Hand Cycle Wheel should be rotated top-to-front. Manual rotation of the Hand Cycle Wheel allows for visual observation of the various functions as they operate at a controlled rate of speed.

A degree scale has been etched on the surface of the Hand Cycle Wheel. Also, a degree wheel is permanently installed on the end of the cycle shaft. These are used to time the various contacts on the I/O.

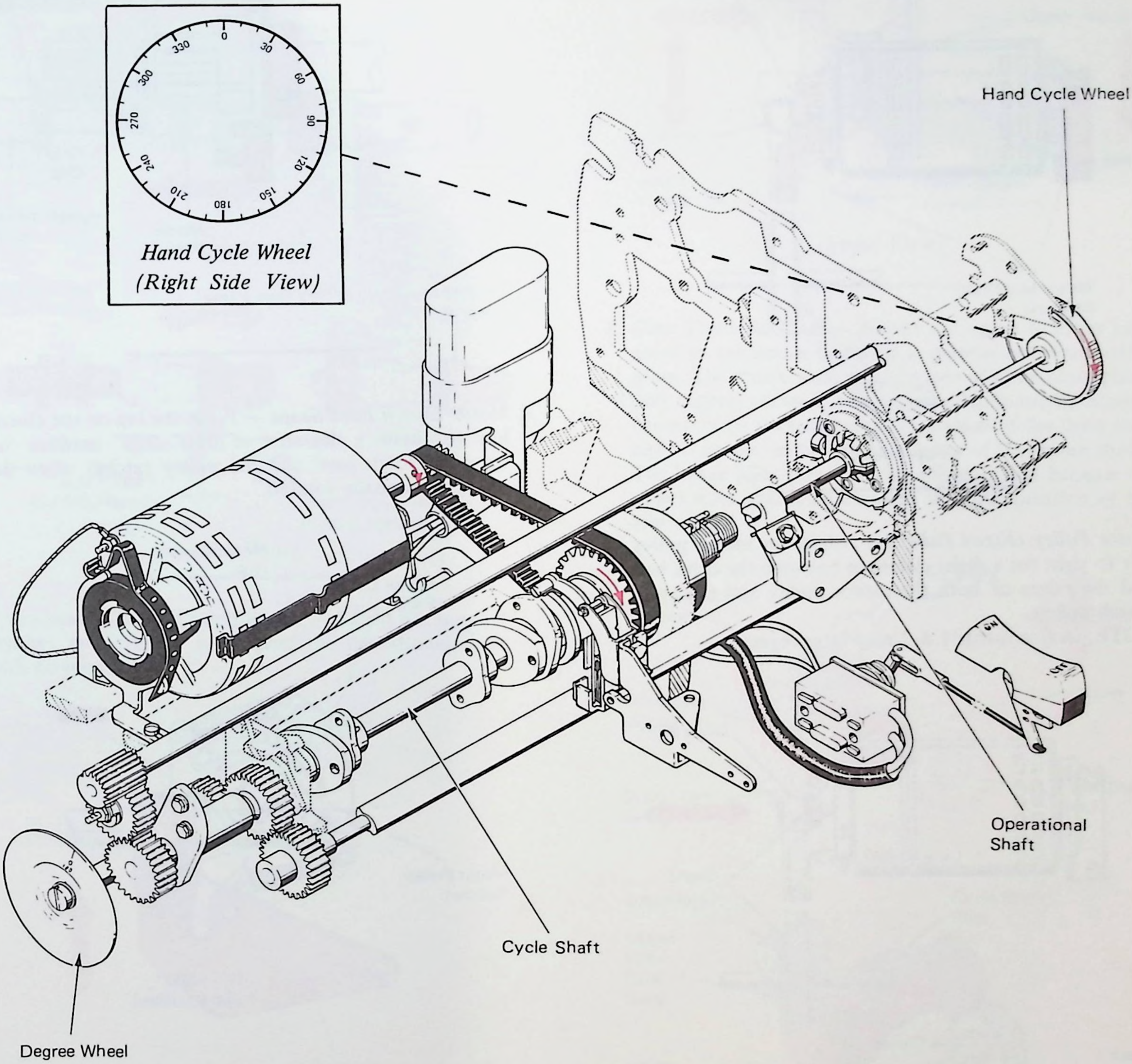
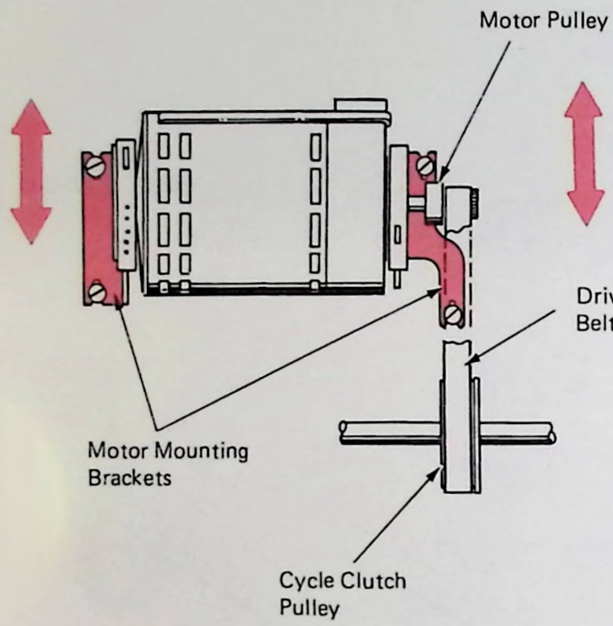


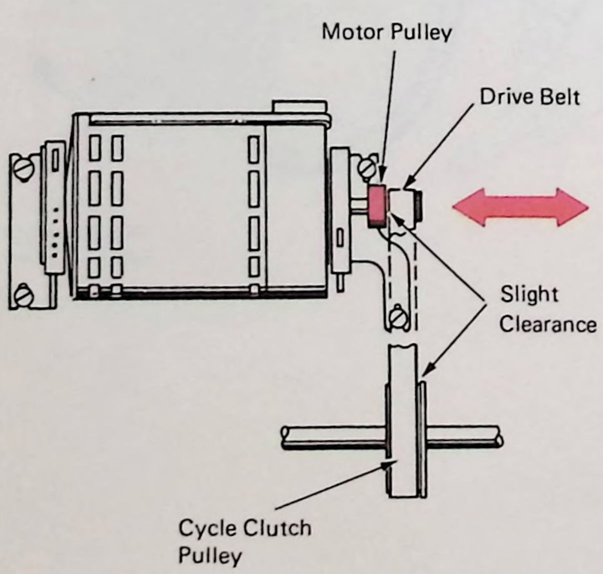
Figure 11 – Hand Cycle Wheel Operation

1. *Drive Belt* – Adjust the motor mounting brackets front-to-rear to obtain a minimum amount of belt noise. The belt must not be loose enough to allow the belt to jump cogs on the motor pulley. Check by operating the carrier return mechanism and holding the carrier while simultaneously operating the shift. This loads the motor to a point where failure will be most probable.



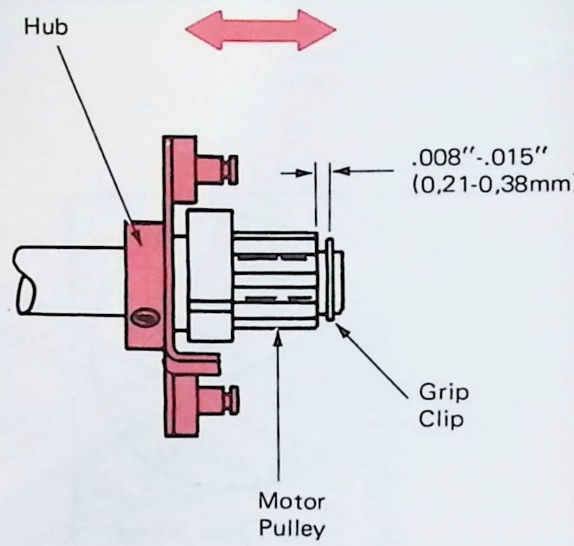
(Top View)

2. *Motor Pulley (Fixed Pulley)* – Adjust the motor pulley left to right for a slight clearance between the drive belt and the edges of both the motor pulley and the cycle clutch pulley.
NOTE: Adjustments 1 & 2 may inter-react.



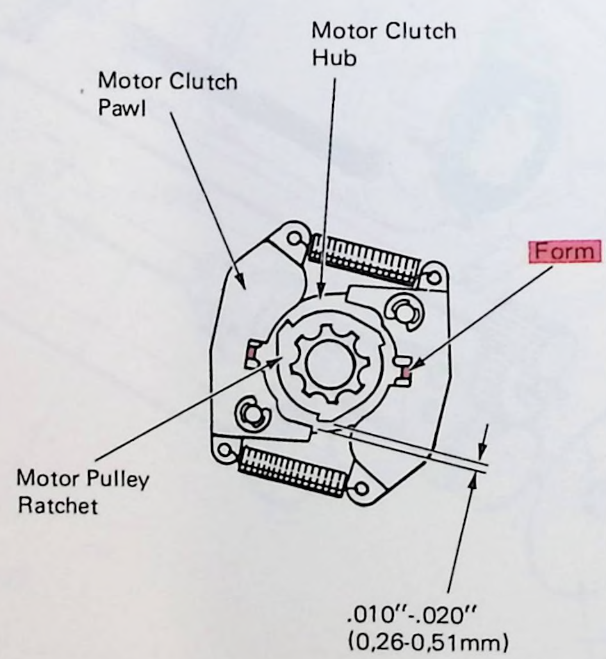
(Top View)

3. *Motor Pulley (Clutch)* – Adjust the hub and grip clip left to right so the belt rides fully on both pulleys. Maintain .008"-.015" pulley end play with the grip clip. NOTE: Make certain the plastic bushing is installed to prevent the motor pulley from "freezing" to the shaft.



(Top View)

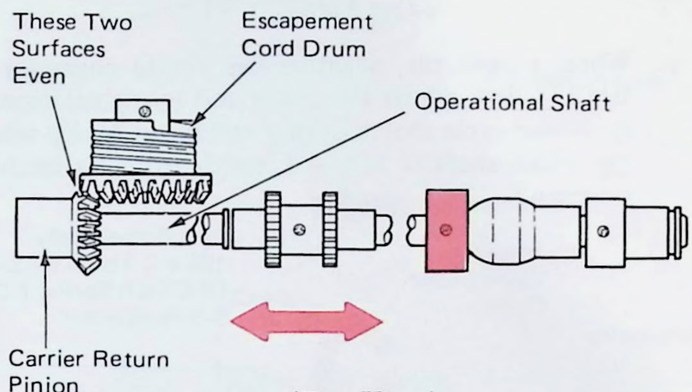
4. *Motor Clutch Pawl Stops* – Form the lug on the clutch hub to obtain a clearance of .010"-.020" between the tip of a clutch pawl and the pulley ratchet when the pulley is manually rotated.



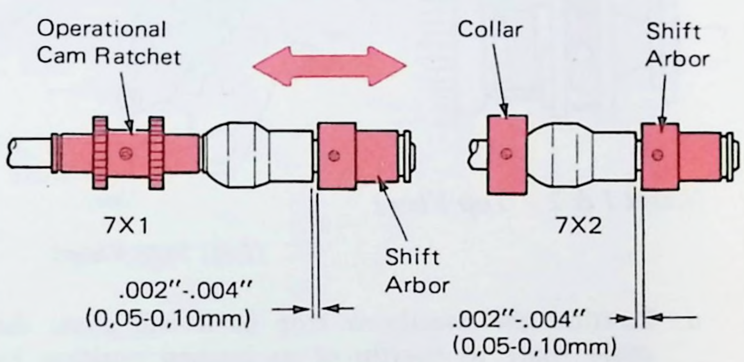
(Right Side View)

5. *Operational Shaft Position And End Play* – Position the operational shaft laterally so the crown surfaces of the escapement cord drum and the carrier return pinion are even while maintaining .002"-.004" end play of the operational shaft. On the Model 7X1 this adjustment is controlled by the operational cam ratchet and the shift clutch arbor. On longer machines, the position is controlled by a collar screwed to the operational shaft and the shift clutch arbor.

NOTE: Check adjustment No. 22 in the Tab Section after making this adjustment.

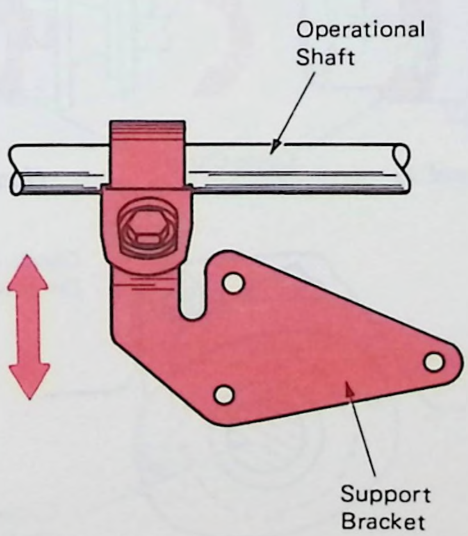


(Top View)



(Top View)

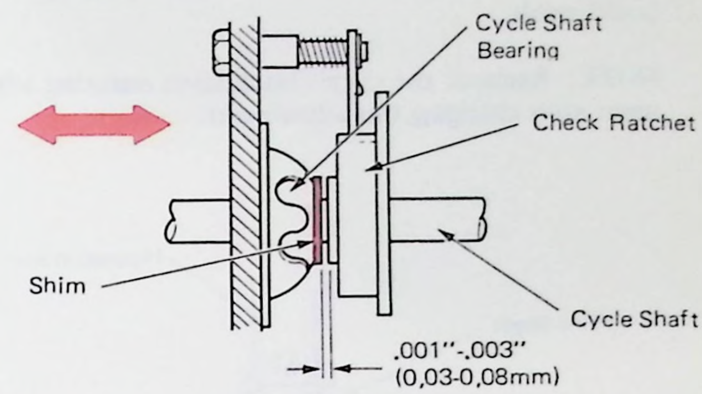
6. *Operational Shaft Center Support* – Adjust the support bracket up or down to support the operational shaft with no binds.



(Front View)

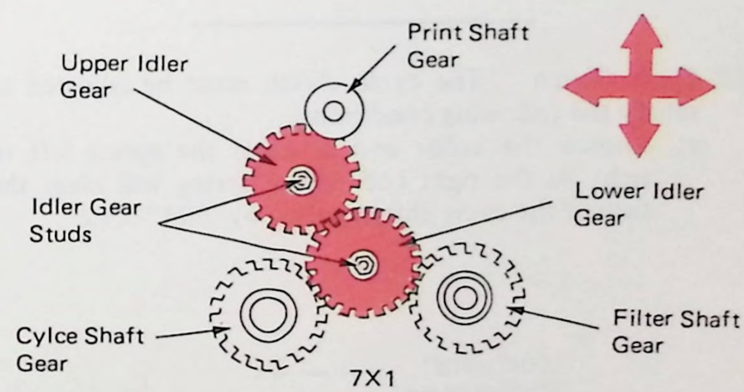
7. *Cycle Shaft End Play* – Shim the cycle shaft to obtain .001"-.003" end play. The shims are placed between the left hand bearing and the check ratchet. The shims are available in various thicknesses and are coded by shape as described in the Parts Catalog.

CAUTION: The slight end play of the cycle shaft ensures that it will rotate freely. Excessive end play could allow a coil of the cycle clutch spring to wedge between the two hub members of the clutch causing a machine lockup.

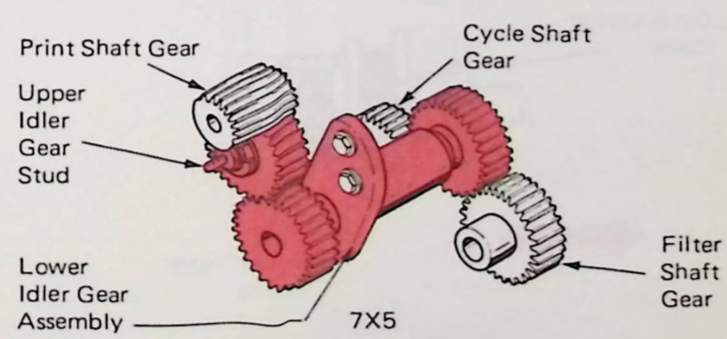


(Front View)

8. *Gear Train Backlash* – Adjust the upper & lower idler gears so minimum backlash is present between mating gears. The mechanism must be free of binds throughout 360 degrees rotation of the gears. Minimum backlash is necessary to prevent erratic operation of the drive train and to ensure minimum overthrow of the driven shafts. The lower idler gear must be adjusted first because the upper idler gear is adjusted to the final position of the lower gear.



(Left Side View)

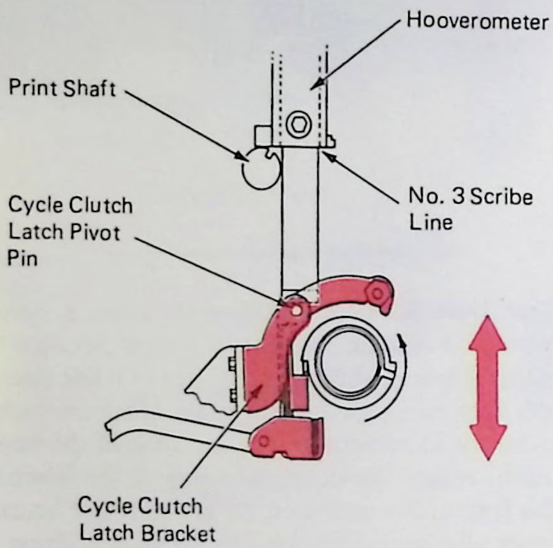


(Left Front View)

9. *Cycle Clutch Latch Bracket* – Adjust the bracket vertically so the Hooverometer, set on the No. 3 scribe line, just spans the distance between the print shaft and the cycle clutch latch pivot pin.

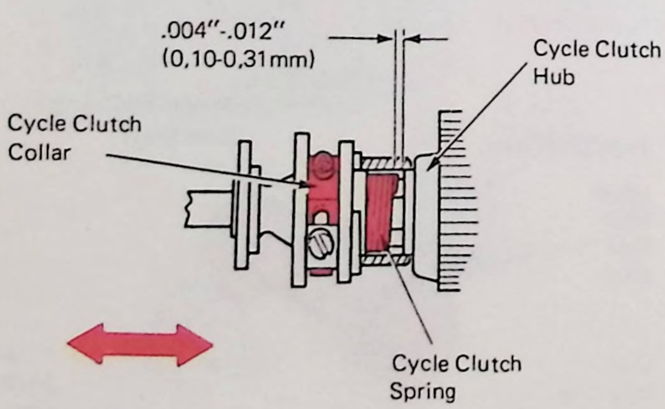
If the bracket is adjusted too low, the steps will be at an angle to the line of motion of the cycle clutch latch. The latch will have difficulty in moving forward to release the clutch sleeve, and a slow, hesitant operation will result. With the bracket too high, the force of stopping the cycle shaft through the cycle clutch sleeve will tend to cam the latch forward. A repeat cycle operation could result.

NOTE: Recheck the cycle clutch latch restoring adjustment after changing this adjustment.



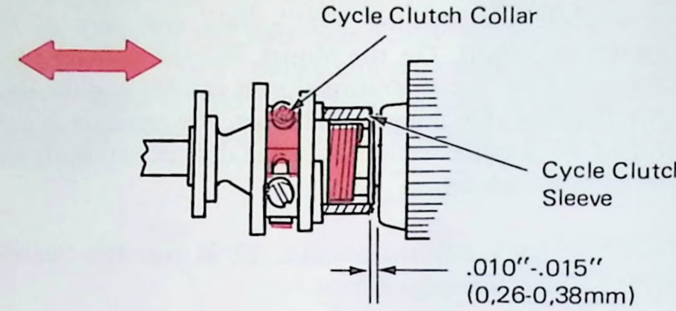
(Right Side View)

10. *Cycle Clutch* – The cycle clutch must be adjusted to satisfy the following conditions:
   a. Loosen the collar and position the spring left to right so the right end of the spring will clear the face of the cycle clutch pulley by .004"-.012".



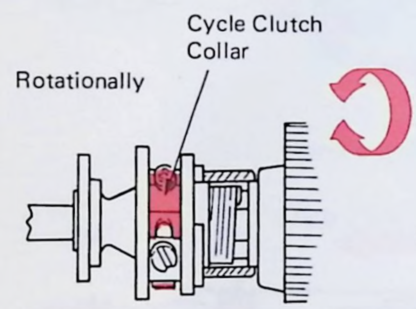
(Top View)

b. Position the collar left to right so the sleeve will have .010"-.015" end play.

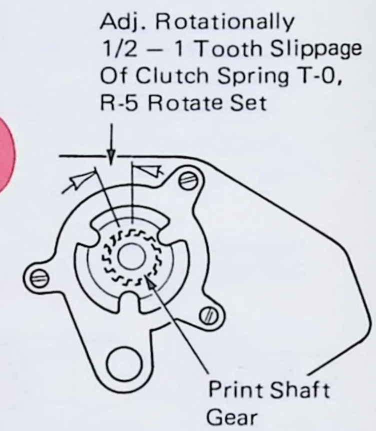


(Top View)

c. When a zero tilt, negative five rotate character is hand cycled, adjust the collar and spring rotationally so the cycle clutch spring will begin to slip when the print shaft is 1/2 – 1 tooth from its latched position.

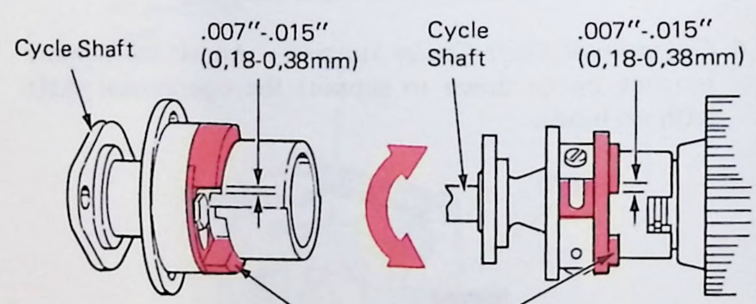


(Level 1 & 2 – Top View)

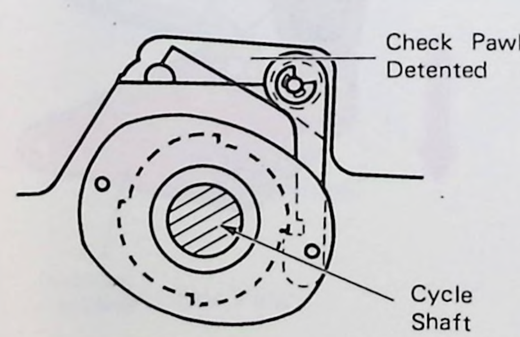


(Left Side View)

d. Position the overthrow stop so it will allow the cycle shaft to overthrow its latched position by .007"-.015".

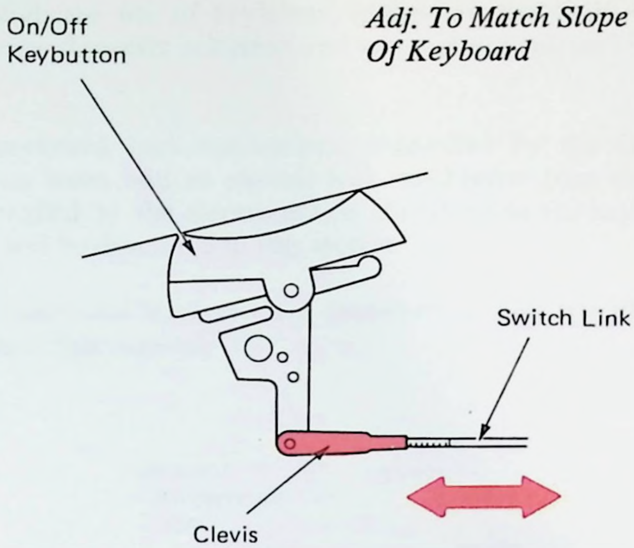


(Level 1) *(Level 2)*



(Right Side View)

11. *Switch Link* – Adjust the switch link clevis so the on-off keybutton matches the slope of the keyboard in the off position.



(Right Side View)

The purpose of the keyboard is to give the operator a means of selecting and initiating the print cycle of the 88 characters on the type element. This is accomplished through the use of keylevers, interposers and bails, which provide character selection and cycle clutch release (Figure 1).

A keyboard lock mechanism, controlled by the On/Off switch lever, and an electric lock mechanism (not shown), controlled by the electronics, is contained in the keyboard and will be described in this section.

All functional keylevers are described in their specific sections of this manual.

The keylevers pivot on a fulcrum rod at the rear. A guide comb stabilizes and limits the vertical travel of the keylevers at the front. Keylever tension is supplied by flat leaf springs under the front of the keylevers. The forward end of each spring is cupped so that the spring wili maintain its position under the keylever. Different spring tension is supplied to the four rows of character keylevers by auxiliary leaf springs under the keylever springs. The auxiliary leaf springs vary in length to offset the leverage difference between the four rows of keylevers. This variation in spring tension permits a uniform operating force for all keylevers.

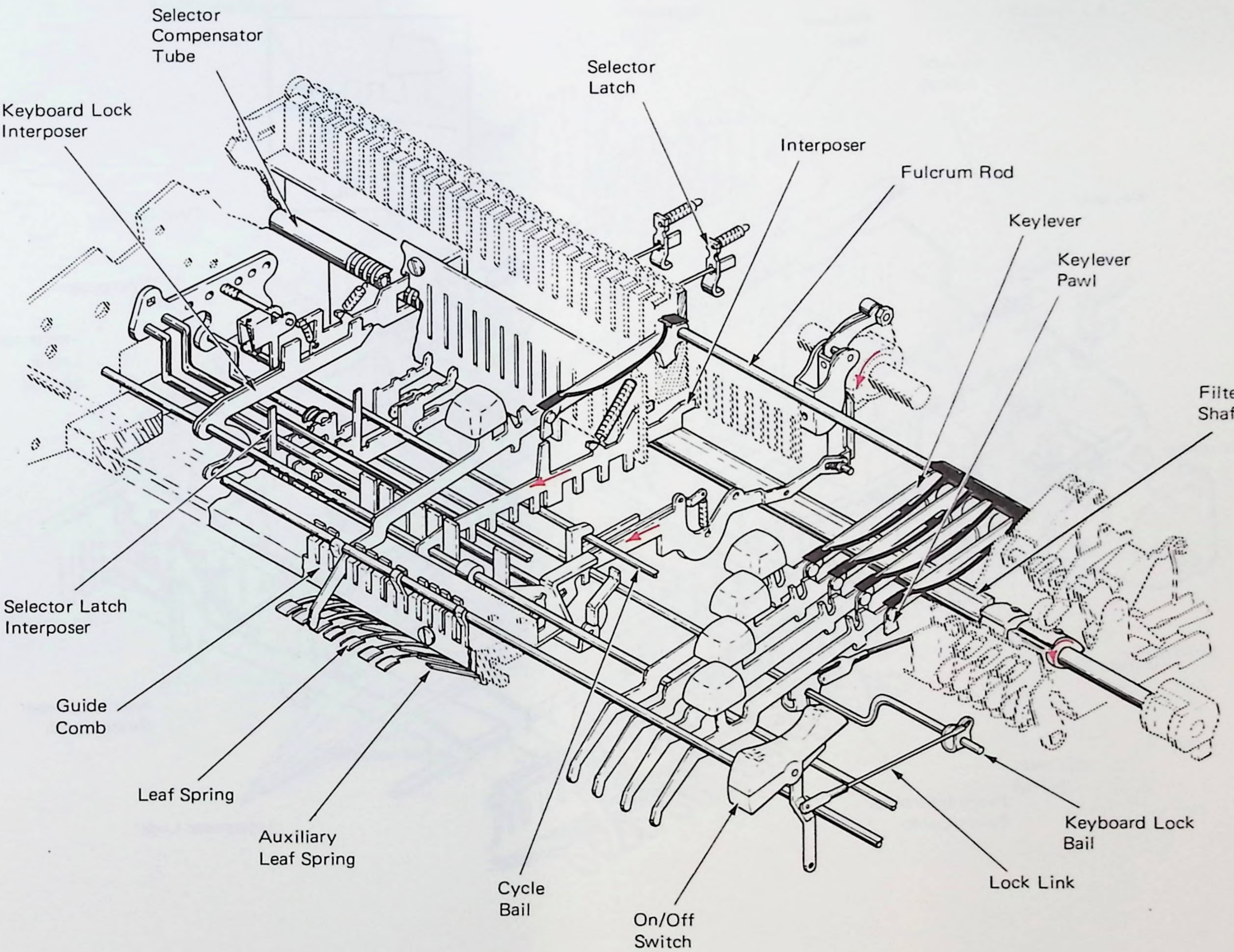


Figure 1 – Keyboard Mechanism

A keylever pawl is attached to each keylever by a shouldered rivet (Figure 2). The pawl is spring loaded and is in a position to contact the top of an interposer.

INTERPOSERS

Each character keylever has an interposer located just below it (Figure 2). The interposer is used to select the amount of tilt and rotate needed to bring the desired character on the typehead to the print position. The interposer pivots about a large fulcrum rod through an elongated slot at the front and is spring loaded up at the rear. The front and rear of the interposer is positioned laterally by guide combs. The interposers are allowed to move vertically in the rear guide comb as well as front to rear.

Each interposer has a specific combination of lugs extending downward. The absence or presence of these lugs will determine which character is selected. The wide lug in the middle is common to all interposers. Its purpose is to release the cycle clutch when a keylever is depressed.

As the keylever is depressed, the keylever pawl contacts the interposer, and forces the interposer to move downward at the rear. Slightly before the interposer contacts the bottom of the rear interposer guide comb, the interposer latch spring moves forward latching the interposer down.

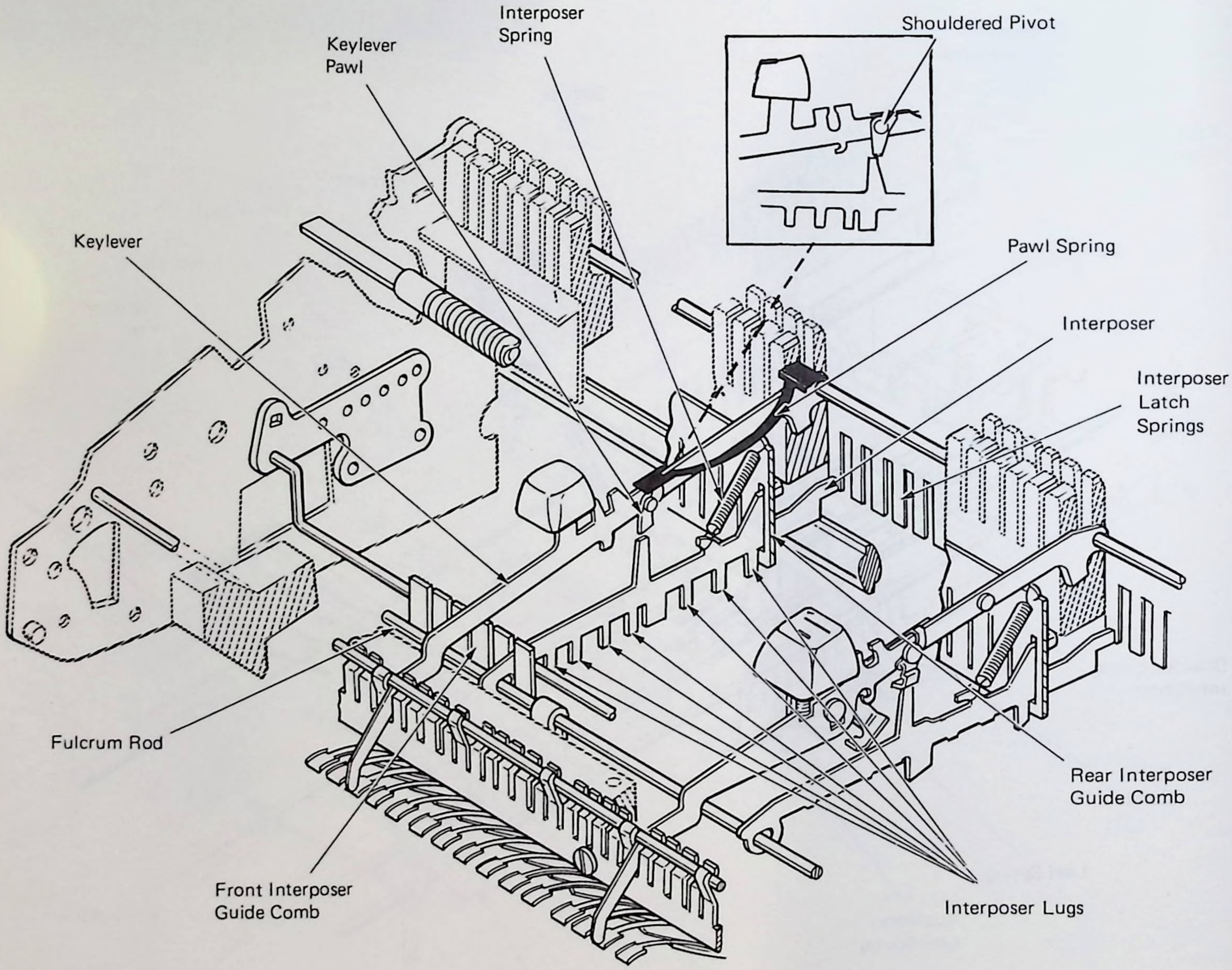


Figure 2 – Interposer

FILTER SHAFT

The filter shaft is mounted just to the rear of the interposers. As the cycle clutch is released the filter shaft will receive rotary motion (Figure 3). Once the interposer is in the latched position, rotation of the filter shaft will drive the latched interposer forward. The interposer lugs will then operate their corresponding selector bails. The interposer motion is sufficient to remove the interposer from beneath the interposer latch spring. This allows the interposer spring to restore the interposer up to its rest position.

LATCH INTERPOSER

Located at the left end of the selector bails are 7 latch interposers (Figure 3). Each latch interposer has a lug that extends up directly in front of a selector bail. As the various selector bails are driven forward, by the lugs on the interposer, the latch interposers are also driven forward. An extension spring at the bottom of each latch interposer loads the interposer and its selector bail to the rear.

An adjustable link connects each latch interposer to one of the selector latches of the character selection mechanism. When a latch interposer is pulled forward, the selector latch connected to that interposer is also pulled forward. The selector latches are discussed in detail in the Character Selection (input) section of this manual.

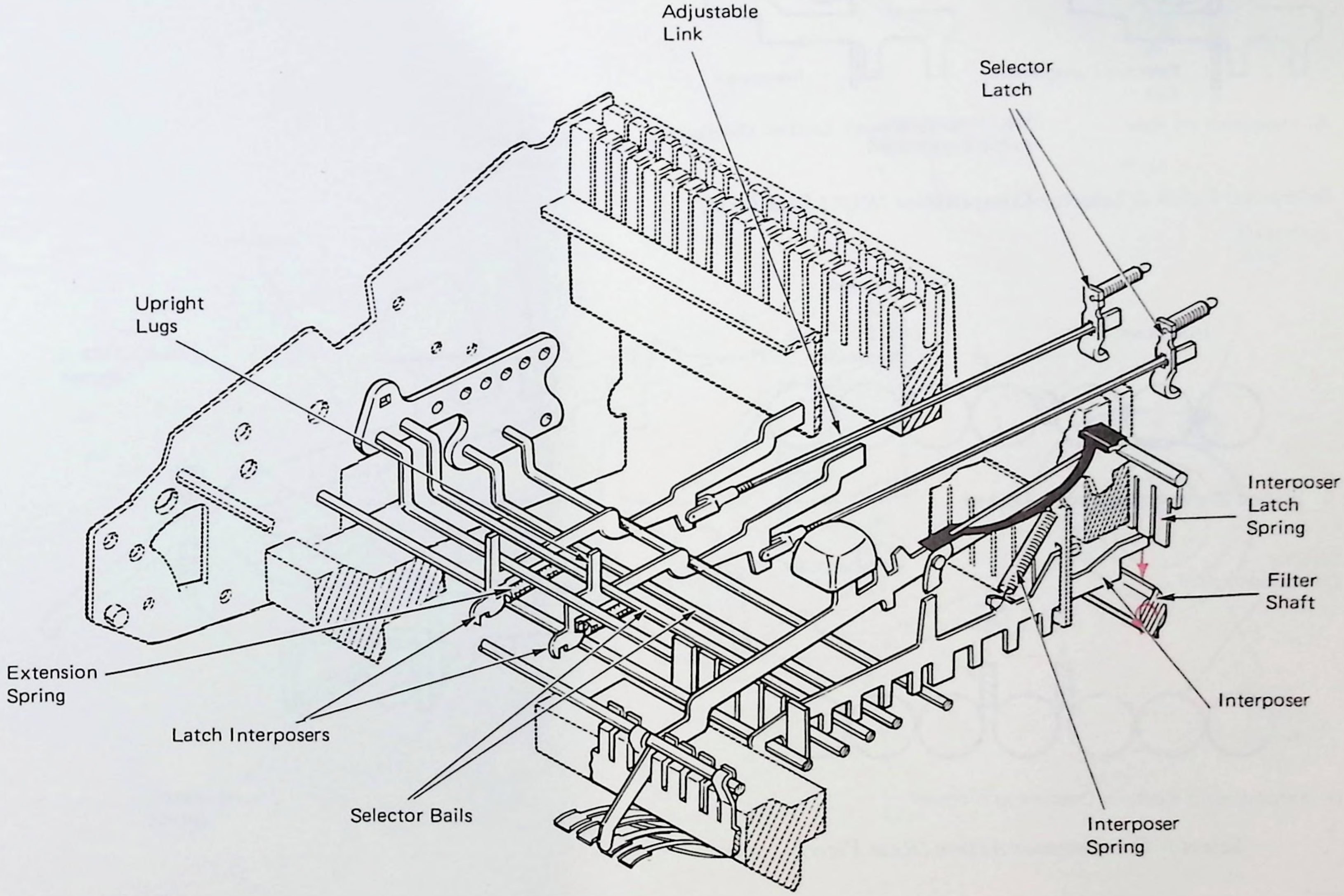
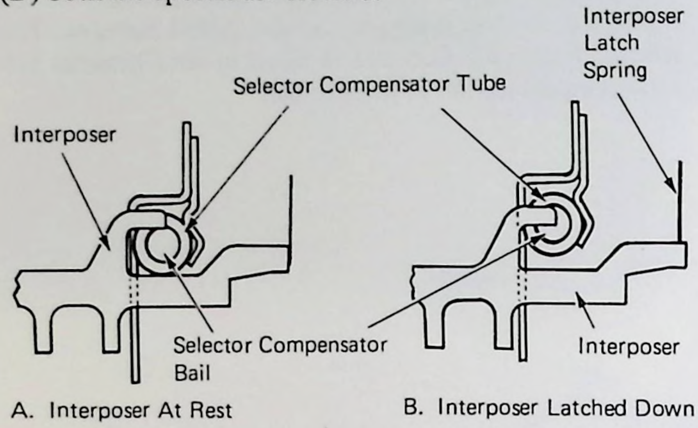


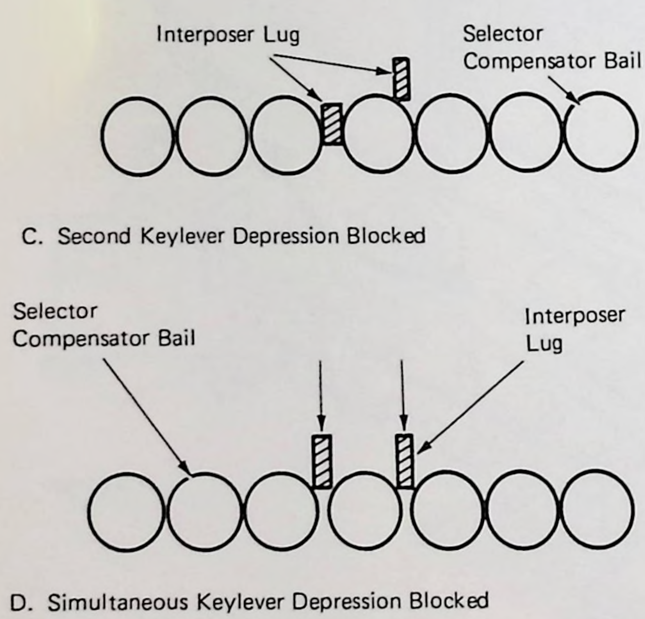
Figure 3 – Latch Interposer

COMPENSATOR TUBE

A compensator tube is used to prevent latching down more than one interposer at a time (Figure 4). Each interposer has a lug that rests above the compensator tube (A). The compensator tube contains closely spaced steel balls. There is only enough space between the steel balls for one interposer. When an interposer is latched down (B), the steel balls shift in the compensator tube to block the downward movement of any other interposer (C). When the interposer is driven forward the tube is cleared to accept another interposer. When two interposers are operated simultaneously, (D) both interposers are blocked.



Interposer Latch & Selector Compensator (Right Side View)



Selector Compensator Action (Rear View)

Figure 4 – Compensator Tube

CYCLE CLUTCH RELEASE

Although not a part of the keyboard, the cycle clutch latch is directly related to the keyboard mechanism (Figure 5). Depression of a keylever will allow the cycle clutch to operate.

The cycle clutch latch pivots on a bracket mounted in front of the cycle clutch pulley. The cycle clutch latch is held in a position to engage the cycle clutch sleeve by the cycle clutch latch pawl and link assembly that extends forward from the cycle clutch latch. The cycle clutch latch pawl pivots on the cycle clutch link. The cycle clutch latch pawl engages the cycle clutch keeper to hold the cycle clutch latch under the step on the cycle clutch sleeve.

When a keylever is depressed, the interposer beneath the keylever forces the cycle bail downward (Figure 5). The cycle bail moves the cycle clutch latch pawl down disengaging it from the keeper. An extension spring at the front of the link is allowed to snap the link and cycle clutch latch forward disengaging the latch from the cycle clutch sleeve. This allows the cycle clutch spring to tighten and begin a cycle operation.

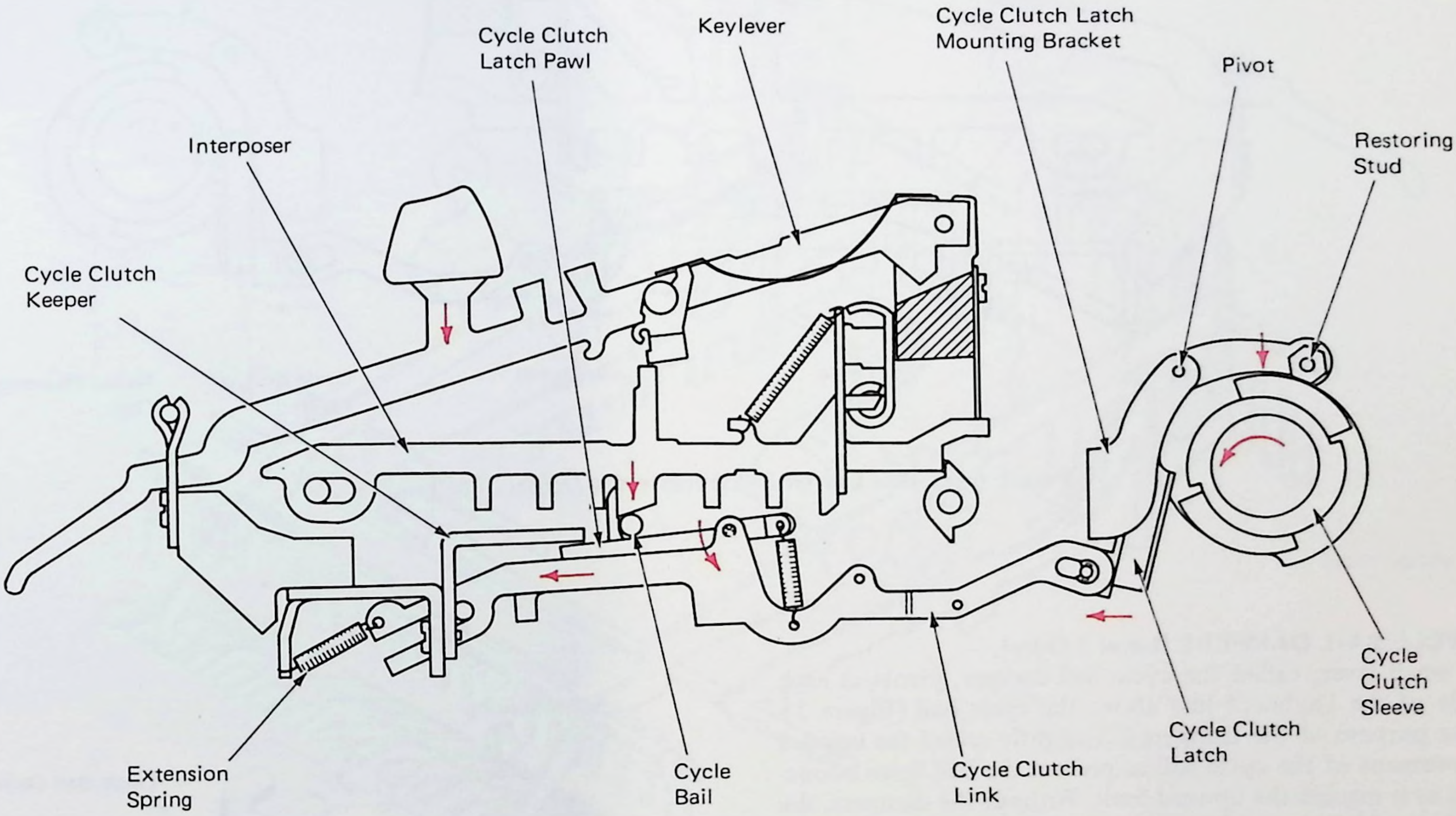


Figure 5 – Cycle Clutch Latch Mechanism (Right Side View)

CYCLE CLUTCH LATCH RESTORING

A nylon restoring cam attached to the cycle clutch clamp restores the cycle clutch latch (Figure 6). A horizontal extension at the top of the cycle clutch latch has a small adjustable stud mounted on it which rides the restoring cam during a restoring operation. When the machine is at rest, the low point of the restoring cam is directly below the stud. When the cycle clutch latch swings forward, the stud on the extension drops down onto the restoring cam. The restoring cam rotates toward its high point and forces the stud on the extension up, swinging the cycle clutch latch to the rear into the path of the next step on the cycle clutch sleeve. The latch is restored far enough to the rear to permit the cycle clutch latch pawl to reset on its keeper.

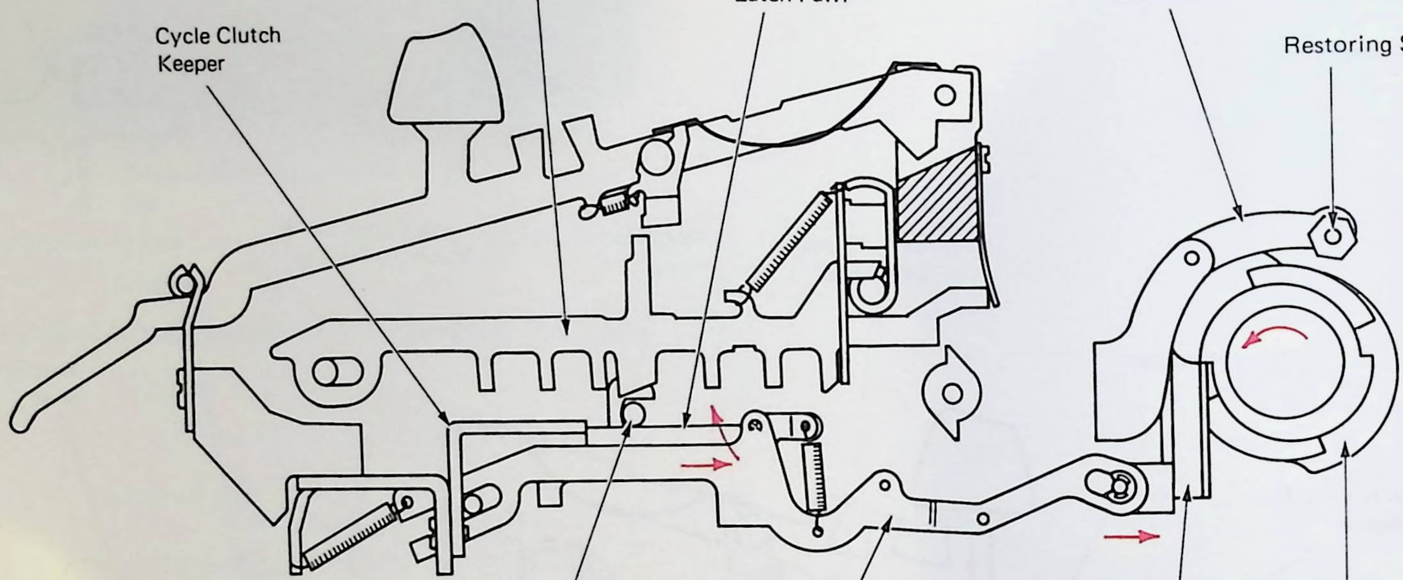


Figure 6 – Cycle Clutch Latch Restoring (Right Side View)

CYCLE BAIL DAMPERS (Level 1 Only)

A small lever, called the cycle bail damper, pivots at each side of the keyboard just above the cycle bail (Figure 7). The purpose of the dampers is to lightly retard the upward movement of the cycle bail to prevent the bail from bouncing as it reaches the upward limit. Without the dampers, the bail would have a tendency to bounce and cause an extra cycle of the cycle clutch.

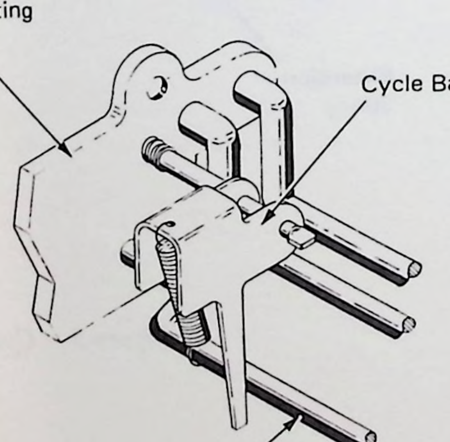


Figure 7 – Cycle Bail Damper (Level 1)

REPEAT CHARACTER KEYLEVER

The hyphen/underscore can be equipped with a repeat/non-repeat keylever. This feature is also available as an option for other keylever positions.

The hyphen/underscore has a two piece keylever (Figure 8). The short keylever mounts the keybutton, and pivots on a shouldered rivet at the rear of the long keylever. A compression spring holds the short keylever up. Initial depression of the keylever will result in a normal character cycle. Further depression will overcome the resistance of the compression spring, and a shoe on the short keylever will force the interposer down beyond its latch resulting in continuous cycling of that character.

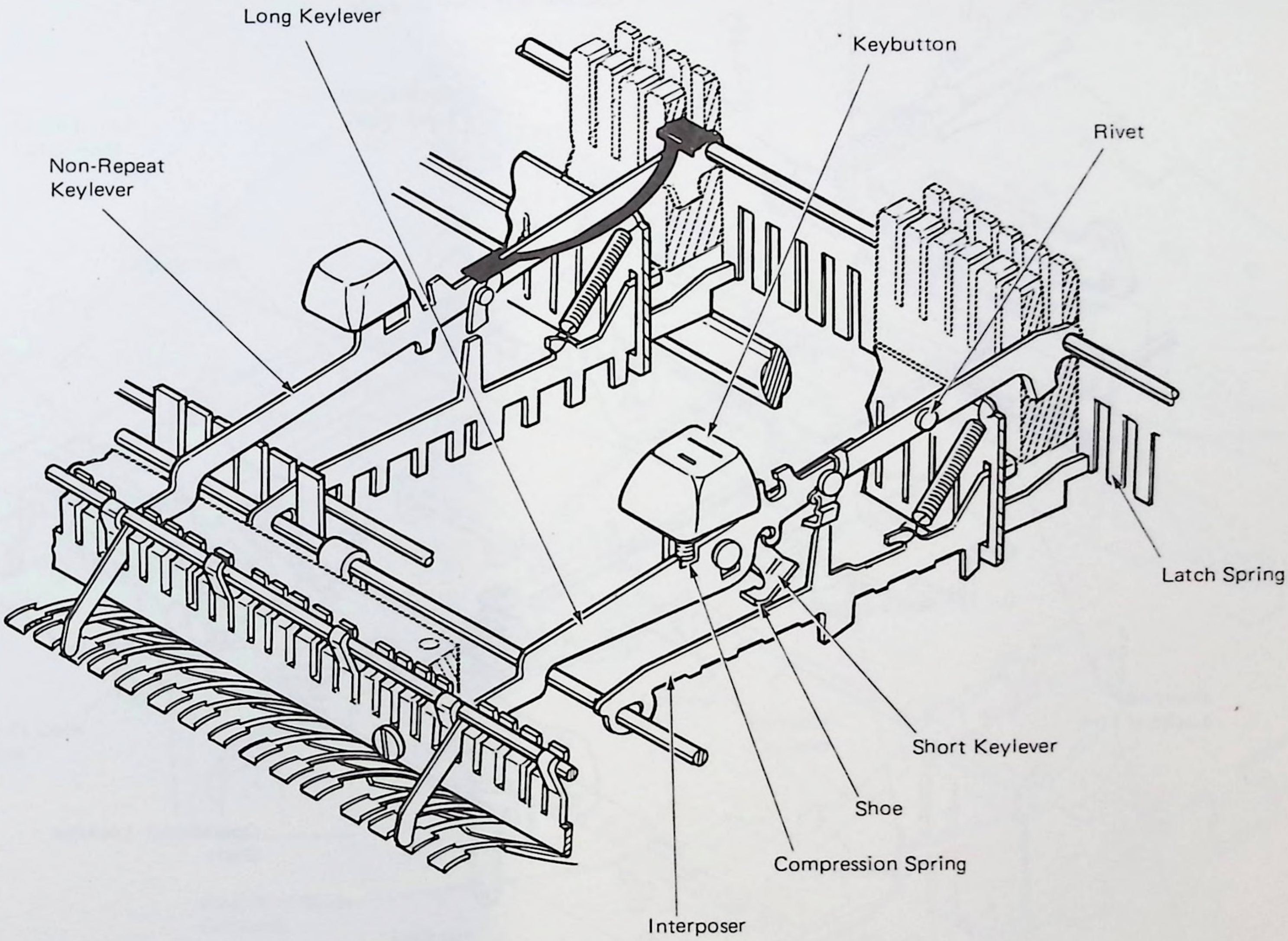


Figure 8 – Repeat Character Keylever

KEYBOARD LOCK

When the switch is in the OFF position, the keyboard must be locked to prevent the motor from having to start under a load and to prevent unwanted operations the next time the switch is turned on.

When the switch is operated to the OFF position and the lockout bail swings forward, three things happened simultaneously (Figure 9).

1. A link pivots the keyboard lockout bellcrank which in turn inserts the lockout interposer into the compensator tube. This prevents the operation of any character keylever and the cycle clutch.
2. The pawl stop is positioned under a lug on the cycle clutch latch pawl preventing release of the cycle clutch.
3. A link rotates a "D" shaped operational lockout shaft to prevent operation of all function keylevers except shift. Shift is the only keylever operation not locked out when the machine is in the OFF position.

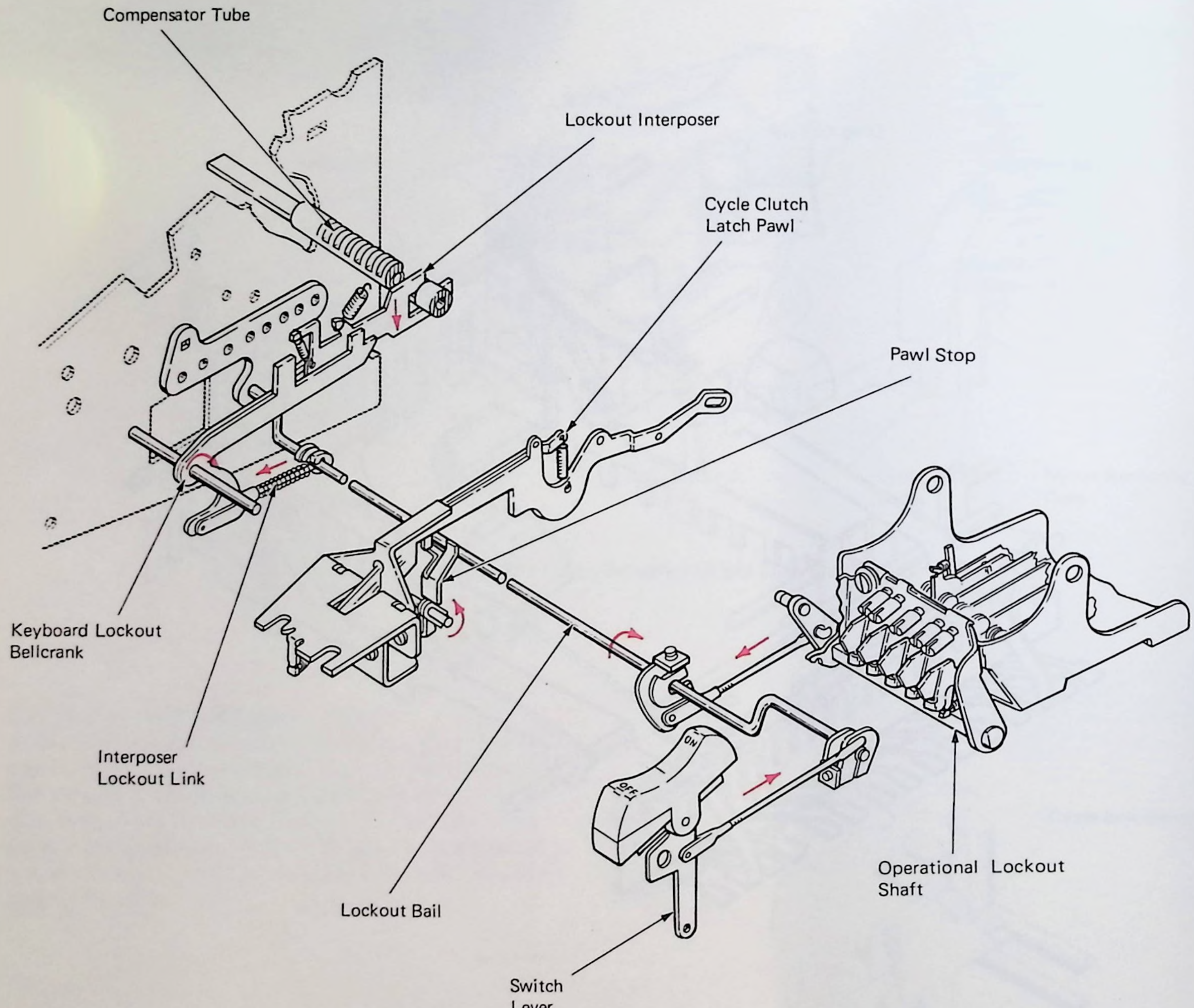


Figure 9 – Keyboard Lock Mechanism

ELECTRICAL LOCK

The purpose of the electrical lock is to provide a means for the electronic device to lock the keyboard when the system is in an output mode of operation. Energizing the lock solenoid prevents operation of all character and function keylevers and ensures the machine is in lower case. The keyboard mode contacts are used to identify to the electronics whether the keyboard is locked or unlocked.

When the lock solenoid is energized, (Figure 10) the front end of the lockout lever is moved down. This cams the lockout bail forward performing several operations simultaneously.

1. The shift lock link moves the shift lock interposer forward. If the shift is locked, the shift lock latch will be cammed off and the I/O will downshift to lower case.
2. The interposer lock link moves the interposer lock bail under the character interposers preventing depression of any character keylever and interposer.
3. The slider assembly moves forward positioning the pawl stop under the cycle clutch latch pawl, thus preventing cycle clutch release from the keyboard.
4. The function lockout link moves forward allowing the spring loaded lockout bellcrank to rotate. The following occurs:
   (a) The lower tab transfers the keyboard mode contacts.
   (b) The upper arm allows the lockout comb to move to the right, locking all functional keylevers but space. If the keyboard is locked in upper case, the shift keylevers must have time to restore. The relief comb will provide the necessary relief until the shift keylever fully restores.
   (c) The upper arm is positioned in the path of the spacebar lockout collar preventing operation of the spacebar.

NOTE: The lockout lever may be reversed to provide a locked keyboard until the lock solenoid is energized.

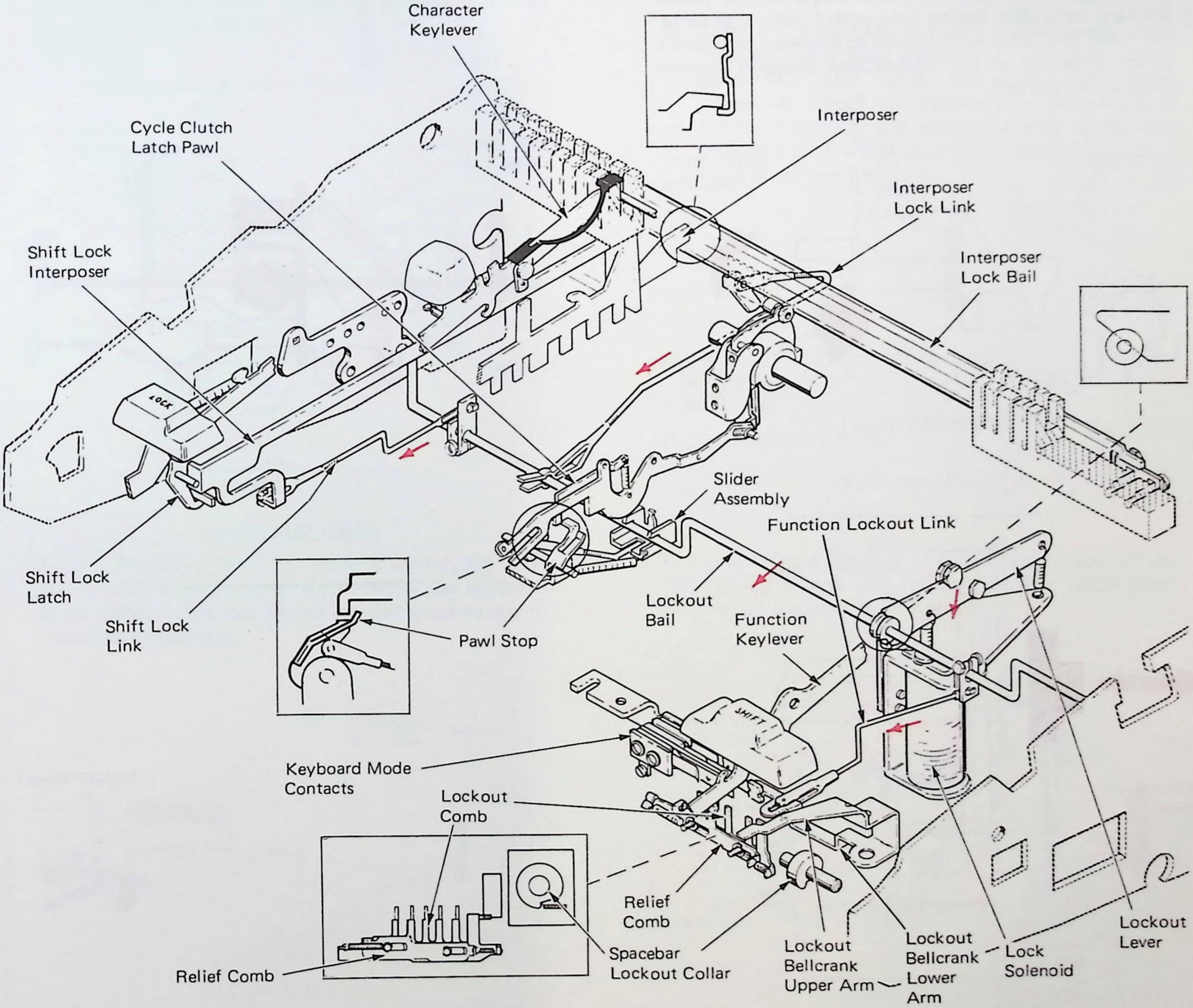
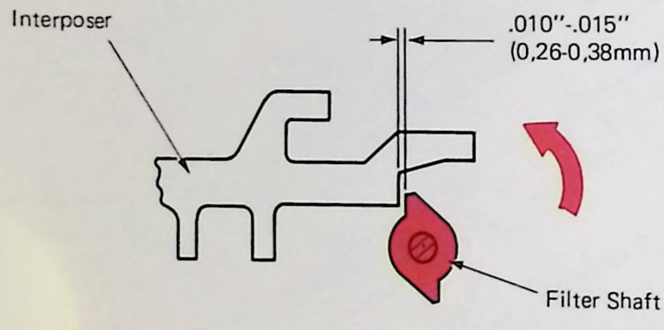


Figure 10 – Electrical Lock

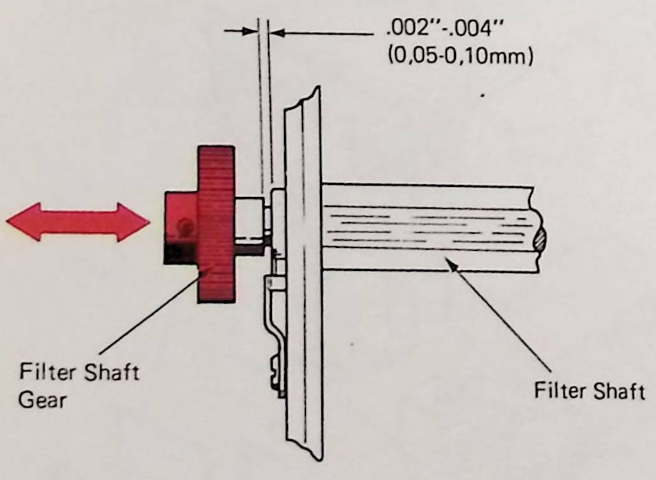
1. *Filter Shaft Timing* – With the machine at rest and all gear train backlash removed in the forward direction, the working surface of the filter shaft should clear the rear of any latched interposer by .010"-.015". Loosen the filter shaft gear and adjust the filter shaft rotationally to meet this condition. Be sure to maintain .002"-.004" end play of the filter shaft within the left hand filter shaft bearing. This adjustment affects the spacebar lockout cam, shift interlock cam, and the escapement cam timing.

   Insufficient clearance between the filter shaft and the interposers could allow the filter shaft to stop just under the rear of the interposers. The keyboard would then be inoperative, because the interposers could not be depressed.

   Excessive clearance would delay the operation of the interposers. The selector latches would not be pulled forward until after having been pulled down slightly by the latch bail. This would result in excessive wear and a noisy operation as the latches were snapped forward from under the bail.



(Right Side View)

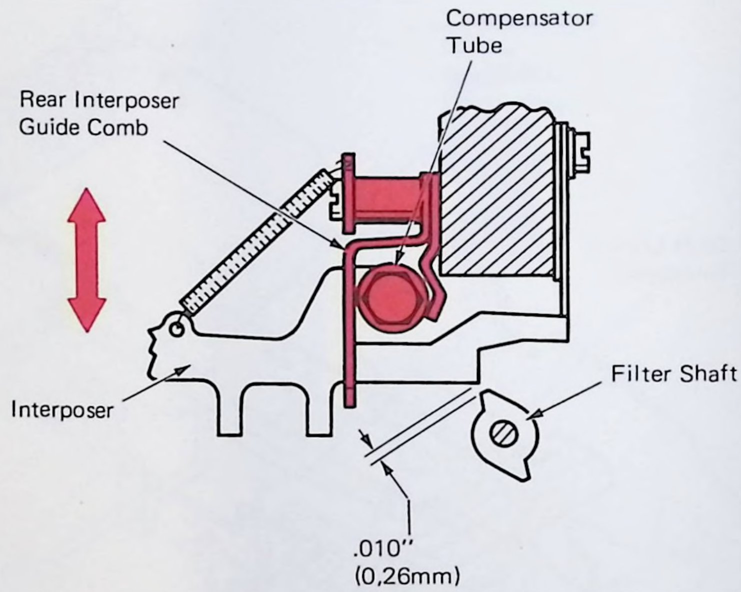


(Front View)

---

2. *Rear Interposer Guide Comb* – With the end interposer latched down, pull any other interposer down with a spring hook. The second interposer should clear the tip of the filter shaft by .010" as the filter shaft rotates under it. Check this at several points along the filter shaft. Loosen the four screws on the guide comb and move it vertically to satisfy this condition.

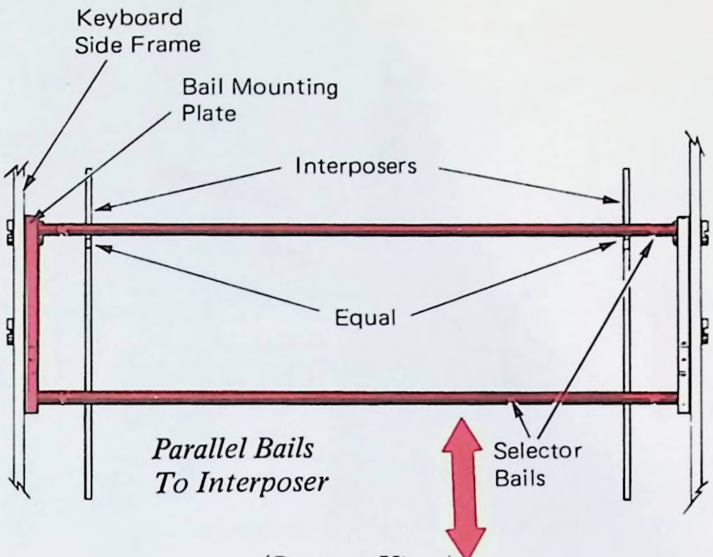
   NOTE: The selector compensator tube is mounted to the rear of the interposer guide comb by four clamps and must move vertically with the guide comb when the guide comb adjustment is made. Be sure to loosen the guide comb mounting screws before attempting to move the guide comb. DO NOT HAMMER THE GUIDE COMB INTO POSITION AS THIS CAN CAUSE THE COMPENSATOR TUBE TO SHIFT WITH RESPECT TO THE GUIDE COMB. The vertical position of the tube is set with respect to the guide comb and should not be disturbed.



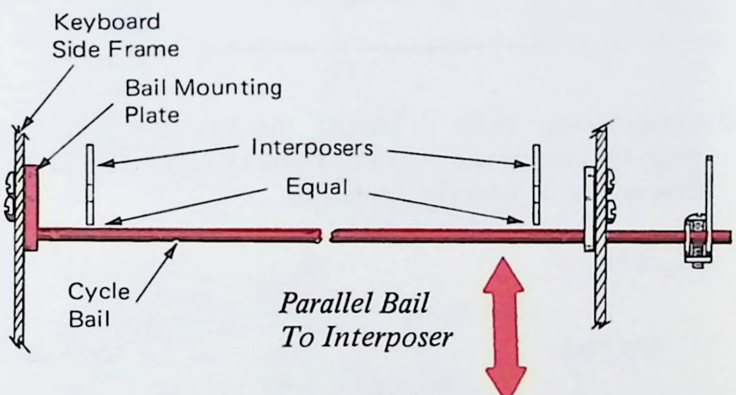
(Right Side View)

---

3. *Bail Mounting Plate* – Position the left hand bail mounting plate to satisfy the following conditions. The selector bails should be parallel front to rear with the lugs on the interposers. At the same time, the cycle bail must be parallel vertically with the lugs on the interposers.



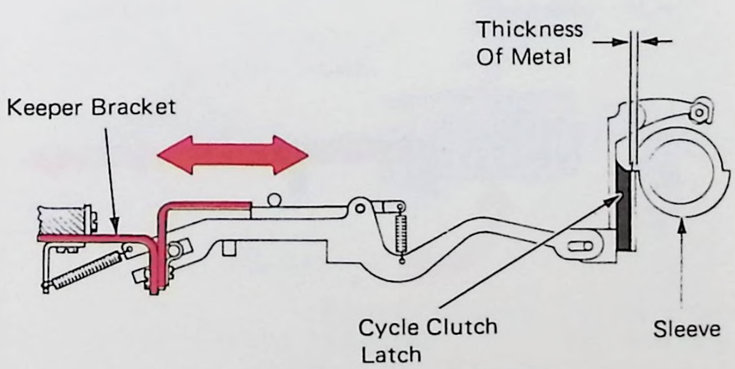
(Bottom View)



(Front View)

---

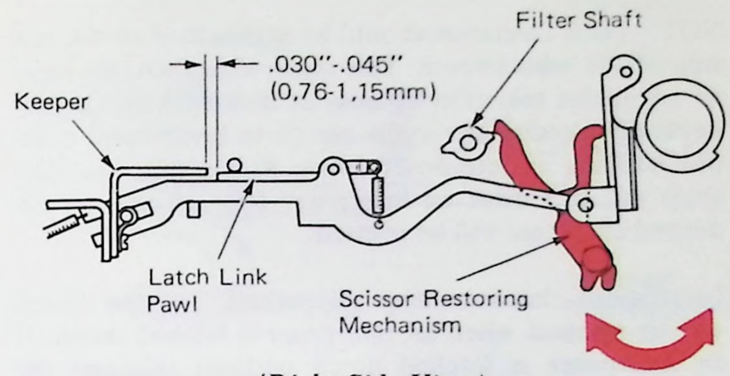
4. *Keeper Bracket* – With the machine at rest, the cycle clutch latch should engage the sleeve by the thickness of its metal. Adjust the keeper bracket front to rear to obtain this condition.



(Right Side View)

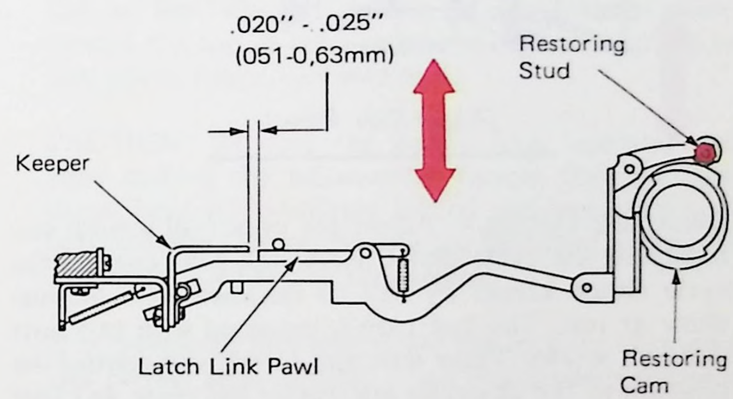
---

5. *Cycle Clutch Latch Restoring – (Level 1)*
   a. Machines equipped with a scissor type restoring mechanism operating from the filter shaft, must be adjusted so the latch link pawl overthrows the keeper by .030"-.045".



(Right Side View)

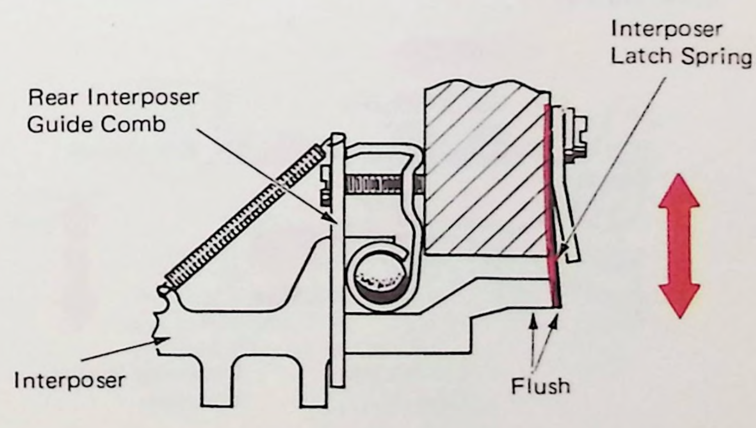
   b. *Level 2* – Adjust the restoring stud vertically so, as the machine is hand cycled, the latch link pawl is pulled .020"-.025" to the rear of the keeper before it restores. Check this clearance on both lobes of the restoring cam and adjust the stud on the lobe providing the least amount of motion.



(Right Side View)

---

6. *Interposer Latch Springs* – Adjust so the end of the latch spring is flush with the bottom edge of the interposer when the interposer is at rest.



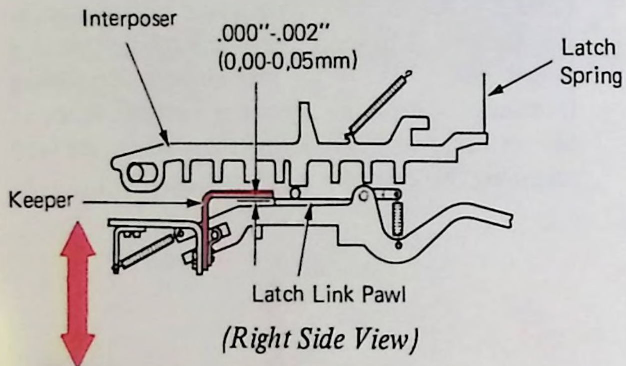
(Right Side View)

---

7. *Cycle Clutch Latch Keeper* – With the pos. 43 interposer latched down, adjust the keeper vertically to obtain .000"-.002" clearance between the cycle clutch latch link pawl and the lower side of the keeper. Then, check the clearance with various interposers latched down. The interposer latch spring may have to be refined to maintain clearance on all interposers. (Adj. 6)

NOTE: This clearance should be maintained on the low side of the adjustments. Too much clearance can cause an erroneous selection because of flicking action on the keylevers causing the cycle clutch to be released without latching an interposer down. As a result, the filter shaft will not drive an interposer forward and an undesired character will be printed.

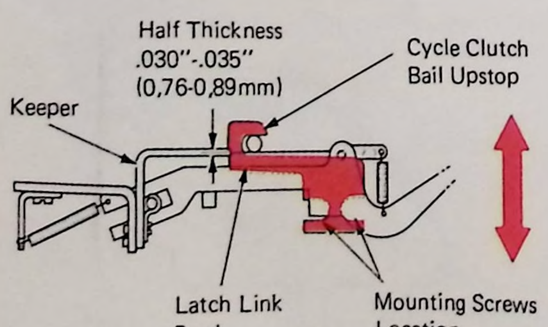
Insufficient clearance does not ensure that the clutch will be released when an interposer is latched down. If an interposer is latched down without releasing the cycle clutch, the keyboard will be locked because the interposer will remain in the compensator tube.



(Right Side View)

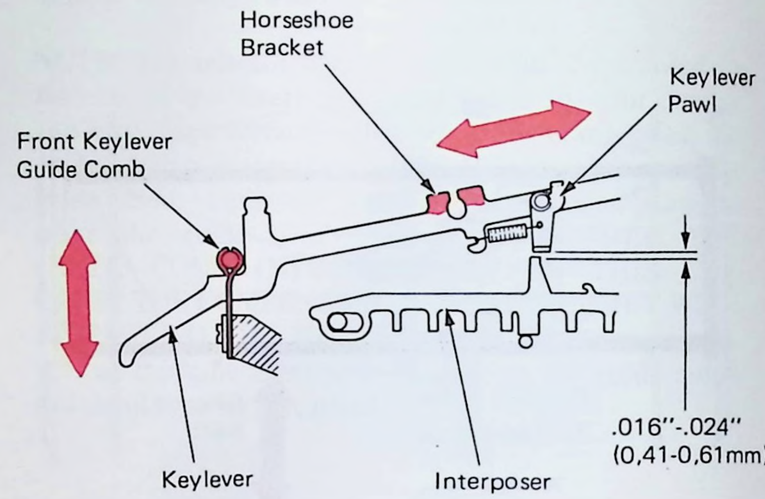
8. *Cycle Bail Upstop* – Adjust the cycle bail upstop vertically so the cycle clutch latch link pawl engages the cycle clutch keeper by half its thickness with the machine at rest. The bail stop is mounted with two nuts and two screws. These nuts and screws also control the position of the character interrupter bail plate. In order to adjust the cycle bail upstop, loosen both nuts and only the front screw. Do not loosen the rear screw.

Insufficient bite will increase the possibility of a repeat cycle because positive latching is not ensured. Excessive bite will affect the touch of the keyboard because the latch pawl must be moved further in order to trip the cycle clutch.



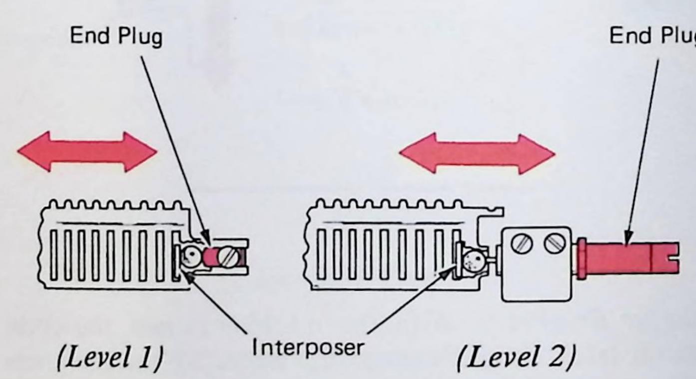
(Right Side View)

9. *Front Keylever Guide Comb* – There should be .016"-.024" clearance between the keylever pawl and the top of the interposer as the keylever pawl resets above the interposer. Adjust the front keylever guide comb vertically to satisfy this condition. Individual keylevers that do not conform to the majority may be formed at the horseshoe bracket.

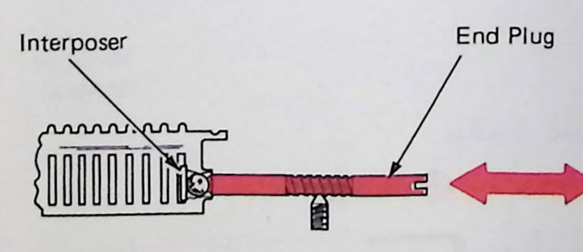


(Right Side View)

10. *Compensator Tube* – Adjust the left and right end plugs for best possible touch. There should be no hesitation as you depress the keylevers.

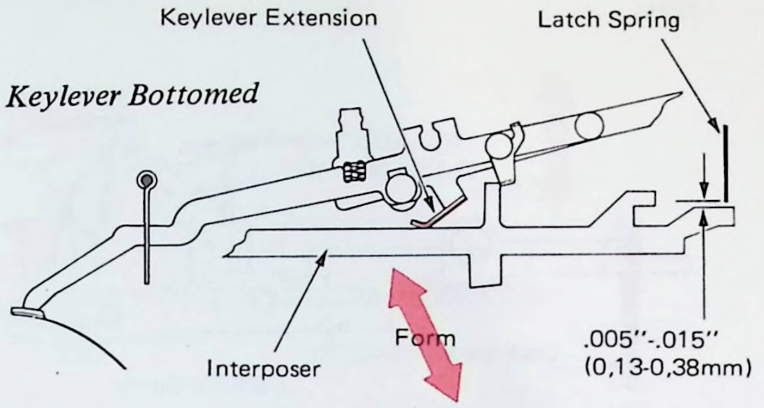


(Level 1) *(Level 2)*



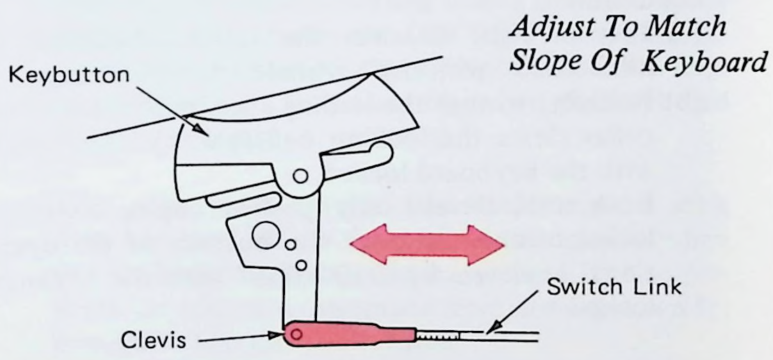
(Level 3 – Front View)

11. Repeat Keylever – Form the keylever extension to cause the interposer to travel .005"-.015" beyond the latched position with the keylever bottomed in the repeat position.



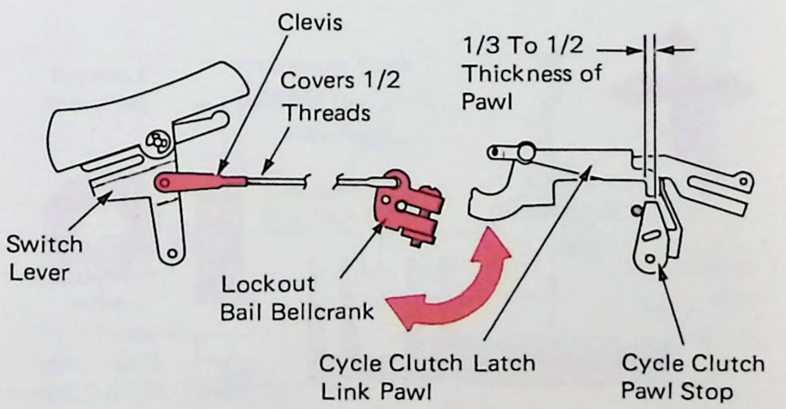
(Left Side View)

12. Switch Link – Adjust the switch link clevis so the on-off keybutton matches the slope of the keyboard in the off position.



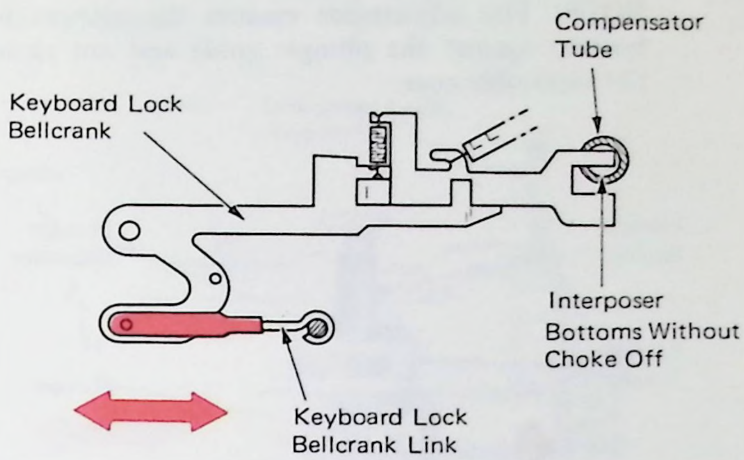
(Right Side View)

13. Lockout Bail Link and Bellcrank – With the clevis covering approximately 1/2 the threads on the link and with the switch lever in the off position rotate the lockout bail relative to the lockout bail bellcrank so the cycle clutch pawl stop overlaps the cycle clutch pawl by 1/3 to 1/2 the thickness of the pawl.



(Right Side View)

14. Keyboard Lock Bellcrank Link – Adjust the link so the bellcrank is fully bottomed in the compensator tube without choking off the action of the lockout bail.

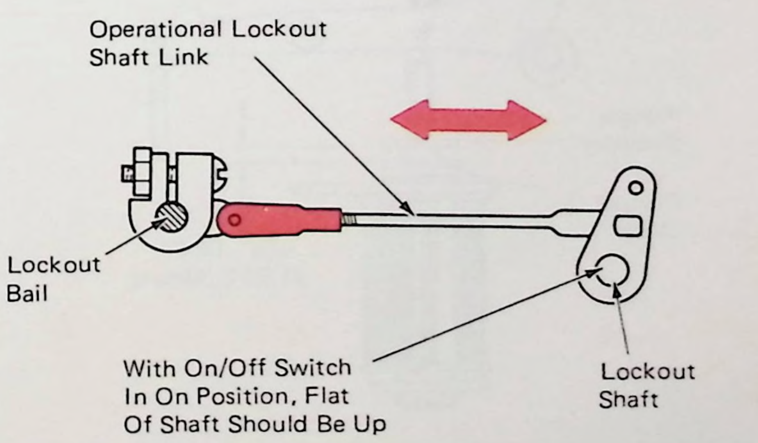


(Right Side View)

15. Operational Lockout Shaft Link – With the switch in the on position, adjust the operational lockout shaft link so that the flat portion of the lockout shaft is toward the top of the machine and parallel to the bottom power frame.

CAUTION: Be sure the switch lever operates easily after making the adjustment. Ensure that the operational keys are positively locked and unlocked in the two switch positions. Be sure the keyboard lockout bail is not restricted by the adjustment.

A mal-adjusted link may cause the lockout shaft to rotate further than normal. When this happens the operational interposers may be locked or slow in releasing since the interposers will rub on the lockout shaft when released.



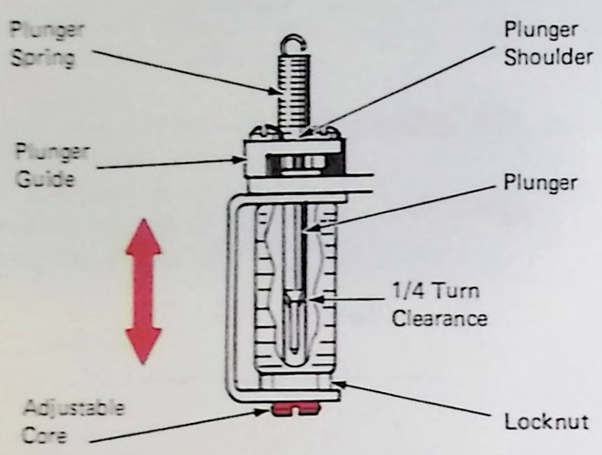
(Right Side View)

16. Lock Solenoid –

a. Screw the plunger spring on plunger to cover all threads.

b. With the plunger engaged, screw the adjustable core "in" until the plunger shoulder begins to lift off the plunger guide, then back off 1/4 turn.

NOTE: This adjustment ensures the plunger will bottom against the plunger guide and not against the adjustable core.

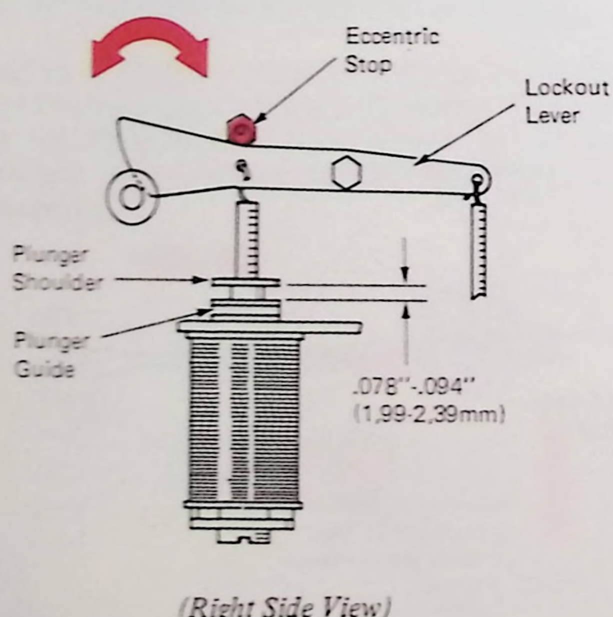


---

17. Eccentric Stop – Adjust (lockout lever resting against the eccentric stop) so that the plunger shoulder clears the plunger guide by .078"-.094".

NOTE: The adjustment of the plunger spring to the plunger may require refinement so that this adjustment falls within the range of the eccentric.

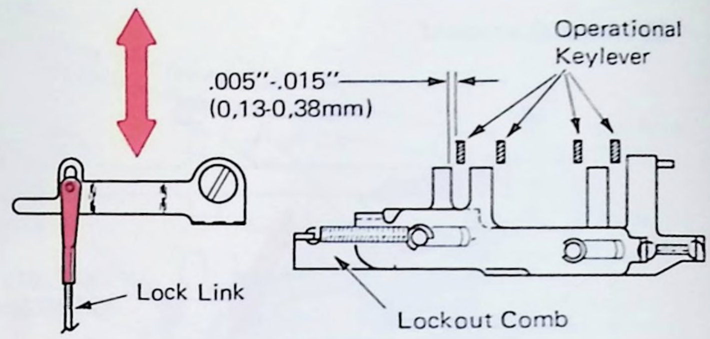
This adjustment ensures adequate motion to lock or unlock the keyboard depending upon the lockout lever which may be installed as shown or inverted.



(Right Side View)

---

18. Keyboard Lock Link – With the keyboard unlocked, adjust the keyboard lock link clevis so that the operational keylevers clear the lockout adjusting comb by .005"-.015". This ensures that the lockout mechanism will not interfere with the operational keylevers and also will not require excessive motion to lock the functions.



(Bottom View) *(Front View)*

---

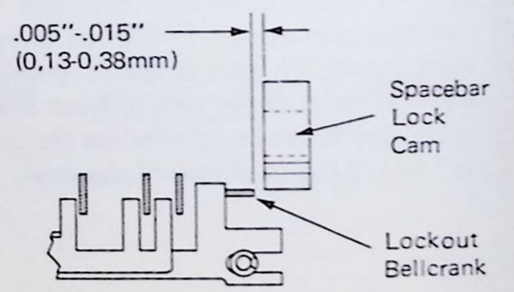
19. Spacebar Lockout Cam & Lock Comb – Position the spacebar lockout cam and lock comb for the following conditions:

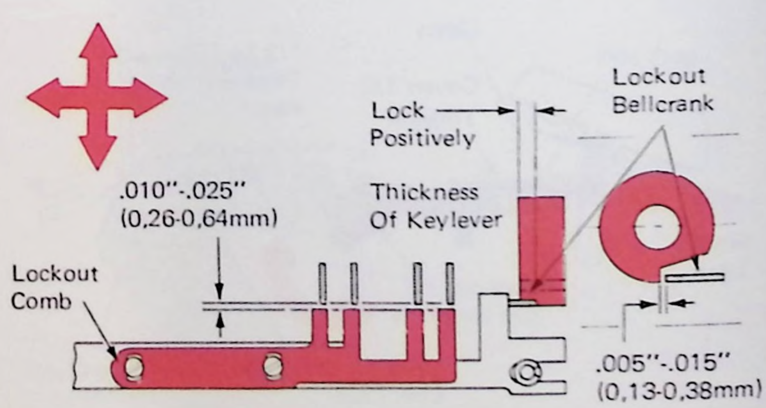
(a) Left or right to clear the lockout bellcrank by .005"-.015" with the keyboard unlocked.

(b) Radially, so that the leading edge on the step of the collar clears the lockout bellcrank by .005"-.015" with the keyboard locked.

(c) Lock comb (level 1 only) position (up or down) the lockout comb to clear the bottom of the operational keylevers by .010"-.025" with the keyboard locked.

This adjustment ensures that the lockout comb will not bind off on the operational keylevers when the keyboard lock is operated.

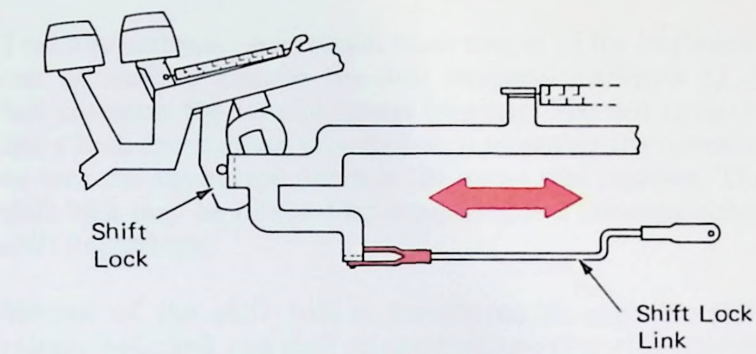




---

20. *Shift Lock Link* – Adjust the clevis to reliably unlatch the shift lock.

NOTE: Check to ensure that the shift lock can be latched with the keyboard lock de-activated.



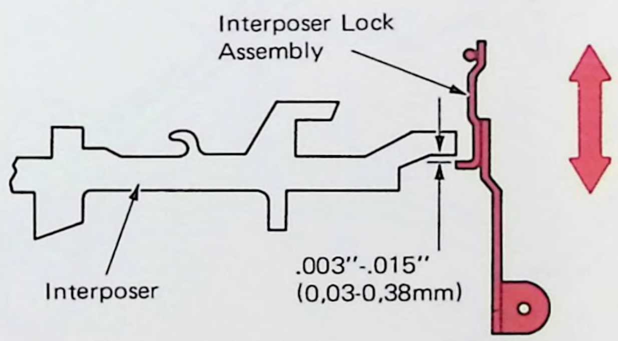
(Right Side View)

---

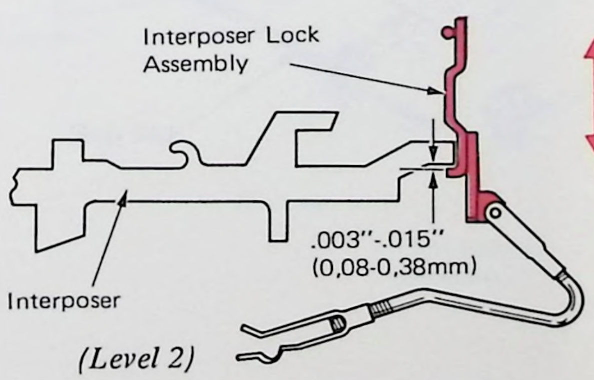
21. *Keyboard Interposer Lock Assembly*

a. Adjust the keyboard interposer lock assembly by loosening the four mounting screws and moving the assembly up or down for .003"-.015" clearance between the bottom of the int[illegible]d the keyboard interposer lock assem[illegible] keyboard interlock assembly is activ[illegible]

This adjustment ensures [illegible]r lock does not bind off on th[illegible] s when the keyboard [illegible] pre-vents the selec[illegible] enough to trip th[illegible]



(Level 1)

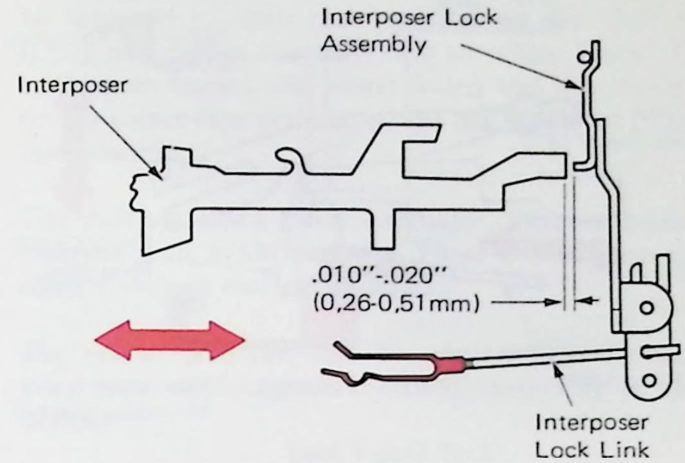


(Level 2)

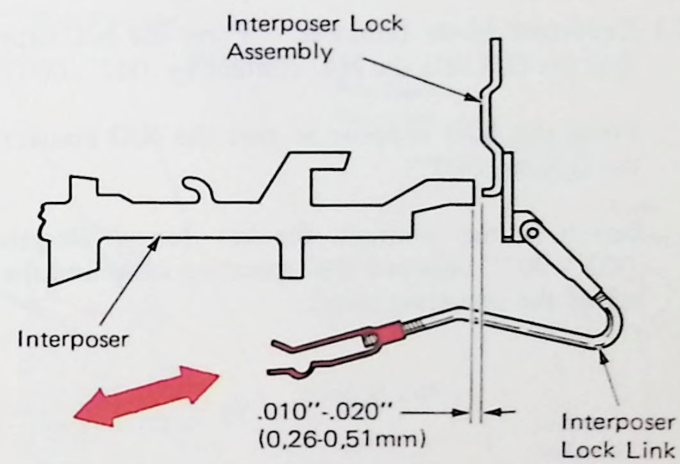
(Right Side View)

b. Adjust the keyboard interposer lock link so there is .010"-.020" clearance between the interposer and the interposer lock assembly with everything in the unlocked position.

This ensures that the interposers will not bind on the interposer lock when operating the printer from the keyboard.



(Level 1)

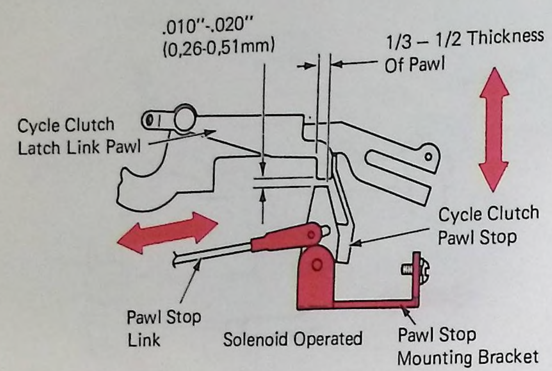


(Level 2)

(Right Side View)

---

22. *Cycle Clutch Pawl Stop Link* – Adjust the pawl stop mounting bracket so that the cycle clutch pawl stop clears the cycle clutch pawl by .010"-.020" with keyboard locked. Best results are obtained on the high side of the adjustment. Adjust the pawl stop link so that there is 1/3 to 1/2 overlap of the cycle clutch pawl stop to the cycle clutch pawl with the keyboard lock mechanism in the lock position.

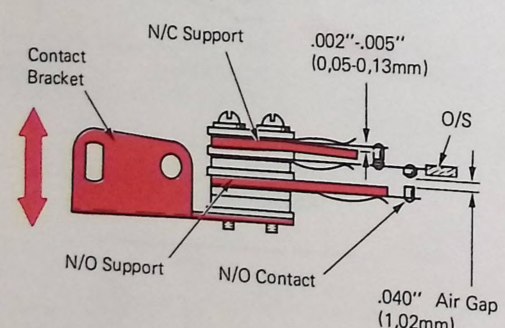


(Left Side View)

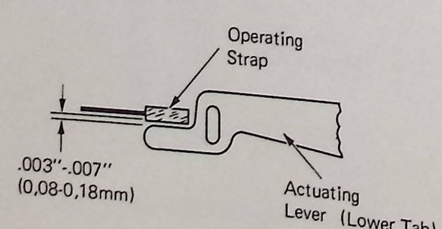
23. *Keyboard Mode Contacts* – Form the N/C support so that the O/S lifts the N/C contact by .002"-.005".

Form the N/O support so that the N/O contact clears the O/S by .040"

Position the contact bracket for a clearance of .003"-.007" between the operating strap and the lower tab of the actuating lever.



(Bottom View)



SHIFT OPERATIONAL THEORY

The purpose of the shift mechanism is to rotate the typehead 180 degrees in the counter clockwise direction. This action places the upper case hemisphere of the typehead near the platen for typing capital letters. Each upper case character is in the same tilt and rotate position as its lower case counterpart, but 180 degrees from it.

Two keybuttons, one at each front corner of the keyboard, can be used to actuate the shift mechanism (Figure 1). A bail connects the two keylevers together. The left keylever has a lock mechanism attached to it to enable the operator to lock the keybutton down in the upper case position. The shift lock may be released by depressing and releasing either shift keybutton.

Motion of the shift bail is transferred through the shift release bellcrank and shift release link to operate the release arm. The release arm controls the shift ratchet and clutch spring to allow the shift cam to rotate.

Depression of the shift keybutton causes the shift cam to rotate 180 deg. forcing the shift arm to move away from the powerframe. This delivers sufficient pull on the rotate tape to rotate the typehead 180 deg. to the uppercase position.

Releasing the shift keybutton allows the shift keylevers to be returned to their rest position by the shift keylever spring and causes the shift cam to return home. The shift arm moves toward the power frame and the spring tension on the rotate tape system returns the typehead to the lower case position.

The shift arm and a contact actuator operates the feedback, transmit, and mode contacts. These contacts are used as a control with an electronic device.

The release arm can also be operated by the upper and lower case shift magnets to allow control by an electronic device.

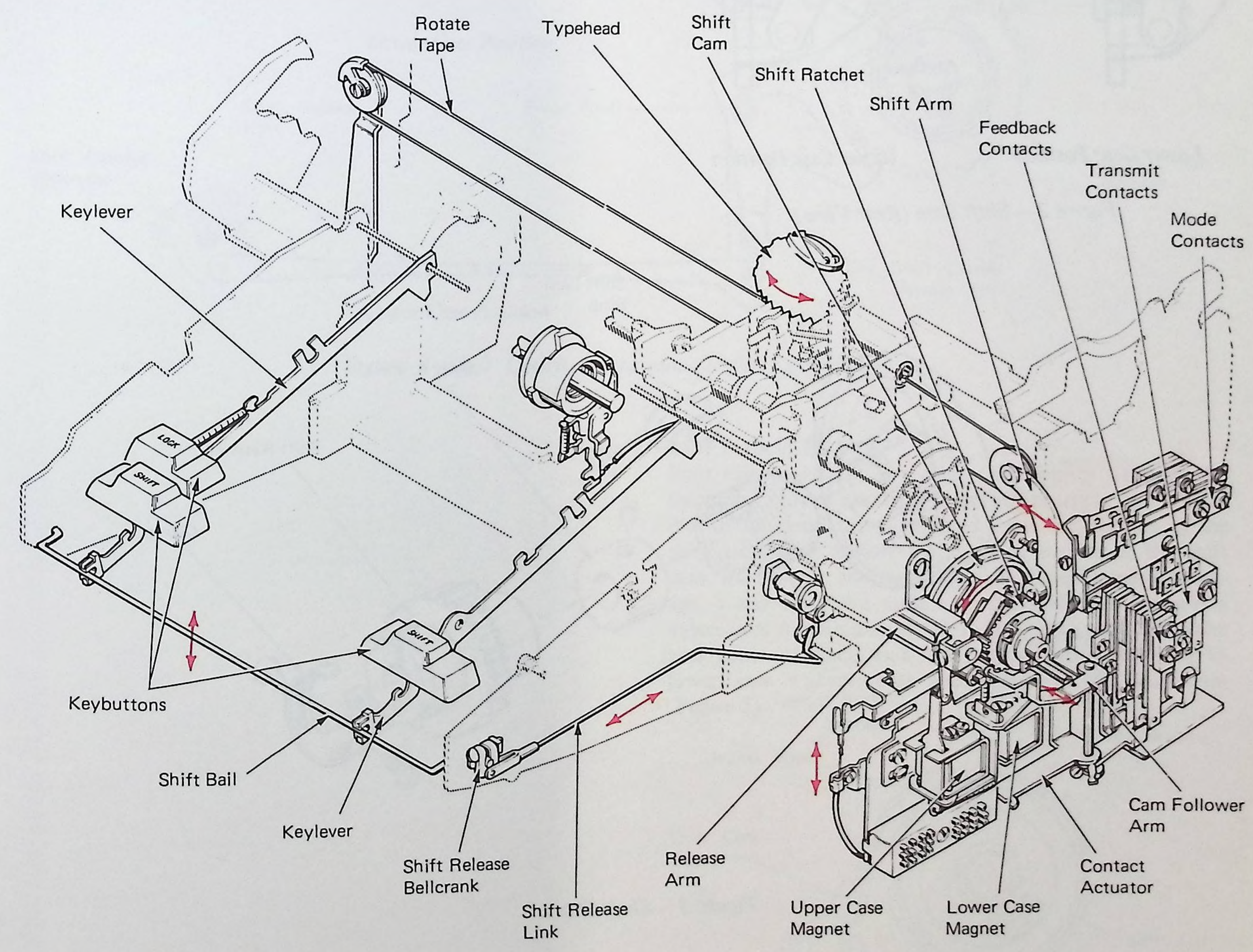
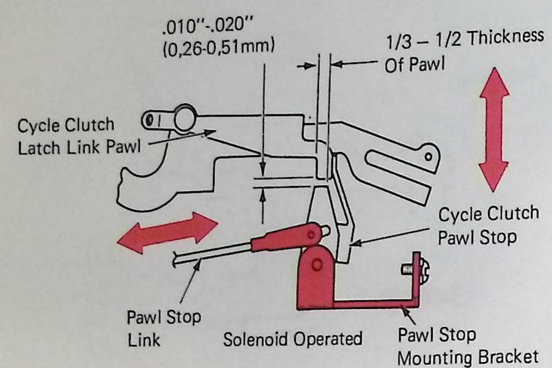


Figure 1 – Shift Operation

22. Cycle Clutch Pawl Stop Link – Adjust the pawl stop mounting bracket so that the cycle clutch pawl stop clears the cycle clutch pawl by .010"-.020" with keyboard locked. Best results are obtained on the high side of the adjustment. Adjust the pawl stop link so that there is 1/3 to 1/2 overlap of the cycle clutch pawl stop to the cycle clutch pawl with the keyboard lock mechanism in the lock position.

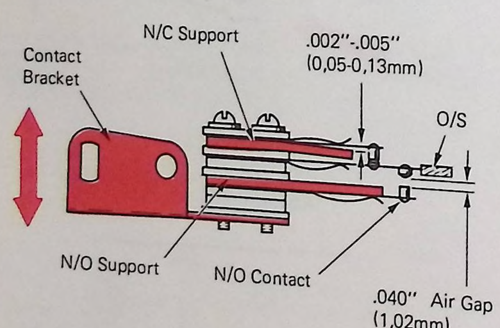


(Left Side View)

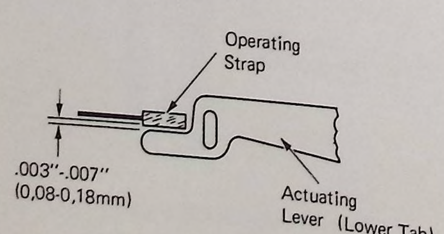
23. Keyboard Mode Contacts – Form the N/C support so that the O/S lifts the N/C contact by .002"-.005".

Form the N/O support so that the N/O contact clears the O/S by .040"

Position the contact bracket for a clearance of .003"-.007" between the operating strap and the lower tab of the actuating lever.



(Bottom View)



SHIFT OPERATIONAL THEORY

The purpose of the shift mechanism is to rotate the typehead 180 degrees in the counter clockwise direction. This action places the upper case hemisphere of the typehead near the platen for typing capital letters. Each upper case character is in the same tilt and rotate position as its lower case counterpart, but 180 degrees from it.

Two keybuttons, one at each front corner of the keyboard, can be used to actuate the shift mechanism (Figure 1). A bail connects the two keylevers together. The left keylever has a lock mechanism attached to it to enable the operator to lock the keybutton down in the upper case position. The shift lock may be released by depressing and releasing either shift keybutton.

Motion of the shift bail is transferred through the shift release bellcrank and shift release link to operate the release arm. The release arm controls the shift ratchet and clutch spring to allow the shift cam to rotate.

Depression of the shift keybutton causes the shift cam to rotate 180 deg. forcing the shift arm to move away from the powerframe. This delivers sufficient pull on the rotate tape to rotate the typehead 180 deg. to the uppercase position.

Releasing the shift keybutton allows the shift keylevers to be returned to their rest position by the shift keylever spring and causes the shift cam to return home. The shift arm moves toward the power frame and the spring tension on the rotate tape system returns the typehead to the lower case position.

The shift arm and a contact actuator operates the feedback, transmit, and mode contacts. These contacts are used as a control with an electronic device.

The release arm can also be operated by the upper and lower case shift magnets to allow control by an electronic device.

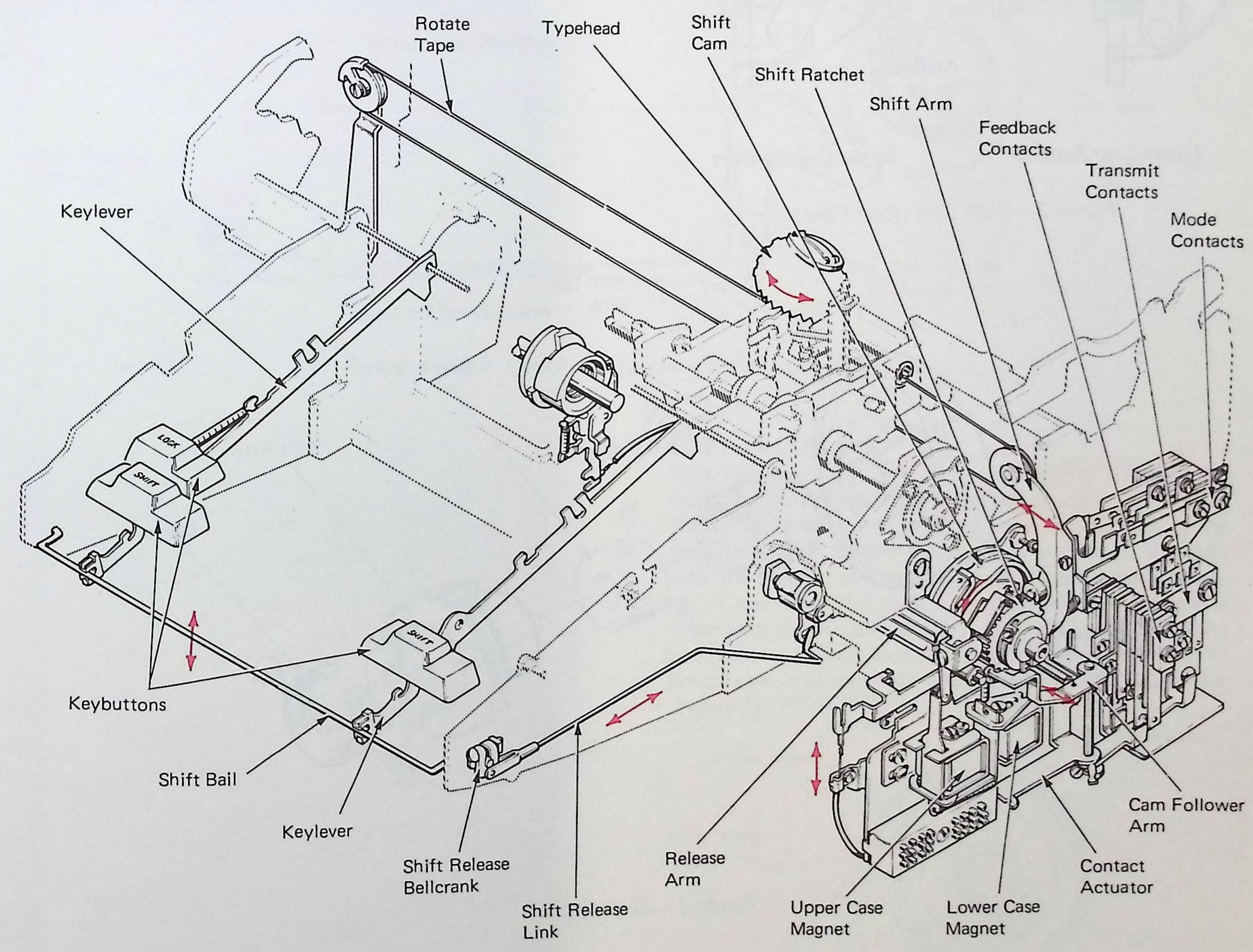


Figure 1 – Shift Operation

As shown in a rear view (Figure 2), the shift cam is a disc shaped cam that has the lobe on the left hand side of the cam rather than on the perimeter. A roller is mounted in a fixed position to the right of the shift cam, directly opposite the roller on the shift arm, and serves as a backup roller for the cam. When the cam is operated 180 deg., the high point is encountered and forces the shift arm to the left into the upper case position.

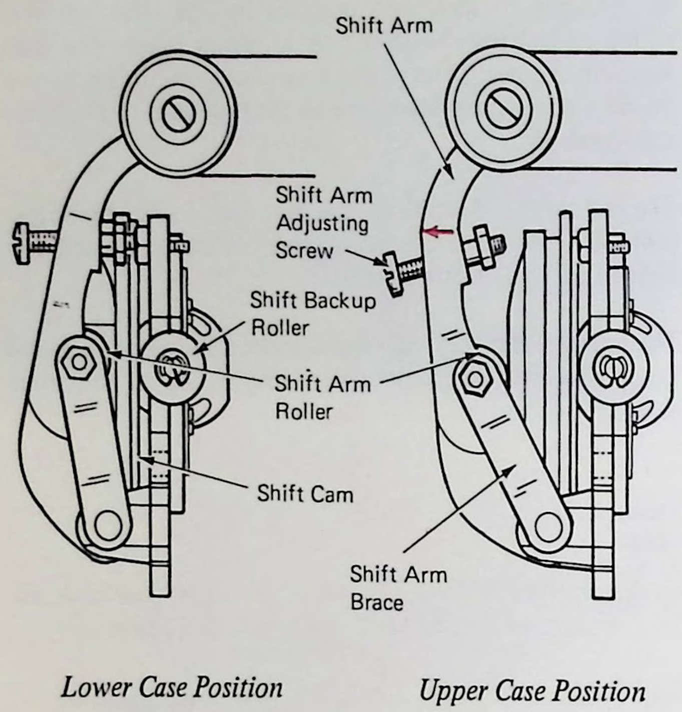


Figure 2 – Shift Cam (Rear View)

SHIFT CLUTCH

The shift cam rotates only during a shift operation and is controlled by a spring clutch. One end of the spring clutch is anchored to the shift cam. The other end of the clutch spring is mounted to the shift ratchet (Figure 3).

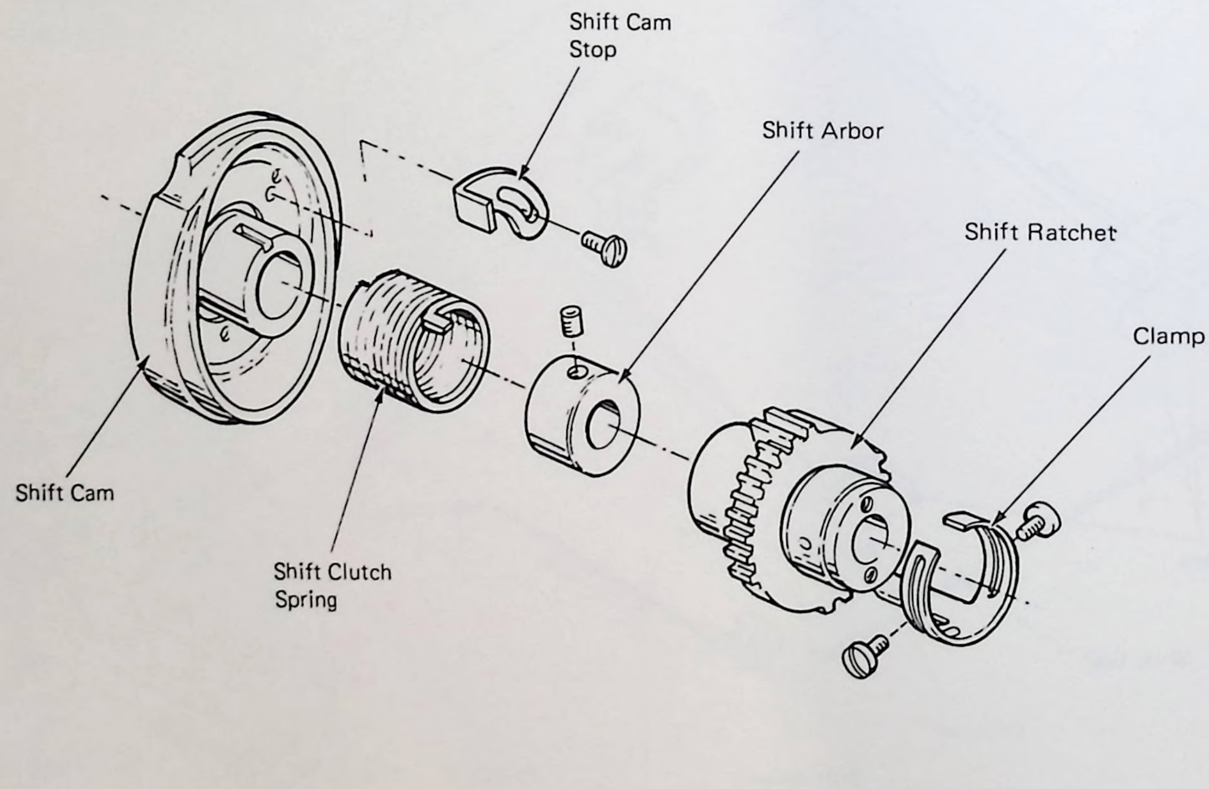


Figure 3 – Shift Clutch

SHIFT CLUTCH RELEASE

The shift ratchet has two lugs protruding to the left side 180 deg. apart (Figure 4). One lug is nearer the center of the ratchet than the other lug. The shift clutch release arm, pivoted just in front of the cam, blocks the lugs to stop the rotation of the ratchet. The position of the shift release arm determines which lug will be stopped. The shift release arm is positioned by a link connected between the shift clutch release arm and the shift release bellcrank attached to the shift bail. When the keylevers are at rest, the release arm is in a position to contact the inner lug of the shift ratchet. Depression of the keylever causes the clutch release arm to rise out of the path of the inner lug into the path of the outer lug. This allows the spring clutch to tighten around the shift arbor and drive the shift cam until the outer lug of the shift ratchet is encountered.

The overthrow of the shift cam is controlled by an adjustable stop attached to the cam and operates against the inner lug of the shift ratchet.

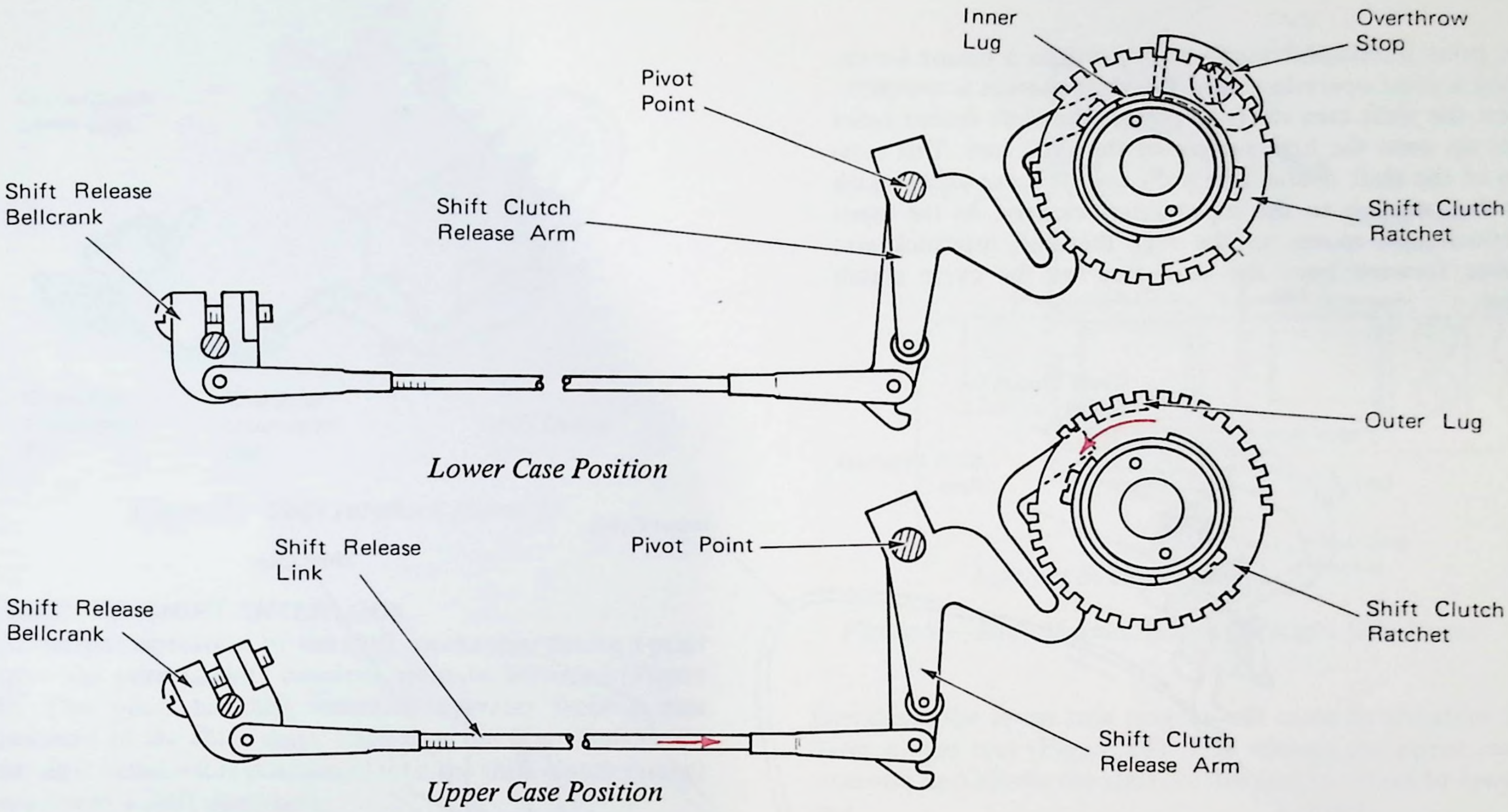


Figure 4–Shift Clutch Mechanism (Right Side View)

SHIFT CAM BRAKE

Shift cam overthrow is a greater problem in returning the machine to lower case than in shifting to upper case. This is due to the acceleration received from the pressure of the shift arm roller against the receding surface of the shift cam. To prevent excessive noise and possible parts breakage, a raised braking surface on the shift cam contacts a nylon shoe mounted on the shift cam brake arm. The brake arm flexes and acts as a heavy spring when returning to lower case and prevents acceleration of the shift cam (Figure 5).

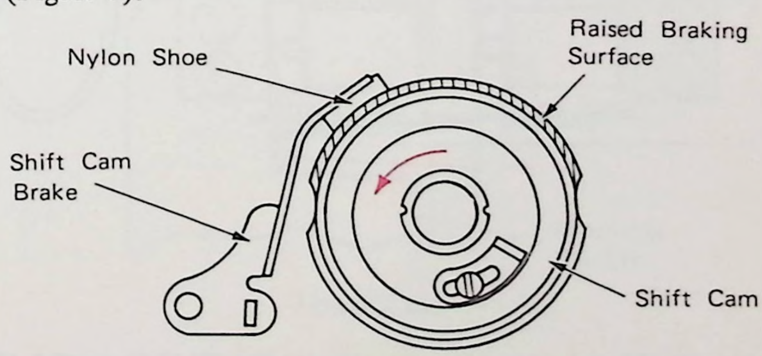


Figure 5– Shift Cam Brake (Right Side View)

SHIFT DETENT AND CHARACTER INTERRUPTER

Mounted on a pivot stud below and to the front of the shift cam is a small arm called the shift detent arm (Figure 6). Although the detent arm operates the character interrupter, its primary function is to detent the shift cam. As the cam approaches either the upper or lower case position a nylon roller mounted on the shift detent arm is spring loaded into corresponding detent notches located on the outside surface of the cam. This detenting action helps to place the cam in its proper rest position for both upper and lower case.

The print interrupter mechanism provides a means for delaying a print operation until the shift motion is complete. When the shift cam starts to rotate, the shift detent roller rides up onto the high surface of the shift cam. This rotation of the shift detent arm pulls on the input cable which transfers motion to the input interlock arm. As the input interlock arm moves to the rear the shift interlock arm rotates forward over the rear step on the cycle clutch sleeve.

The shift interlock arm will remain engaged until the shift cam detent roller enters the detent notch of the shift cam. This ensures that the cycle clutch sleeve will not be released until a shift operation is complete. This interlocking action does not prevent the depression of a keylever or an interposer. The interposer is latched down into storage. When the shift operation is completed and the detent enters the detent notch, the shift interlock arm will restore and the cycle clutch will be released.

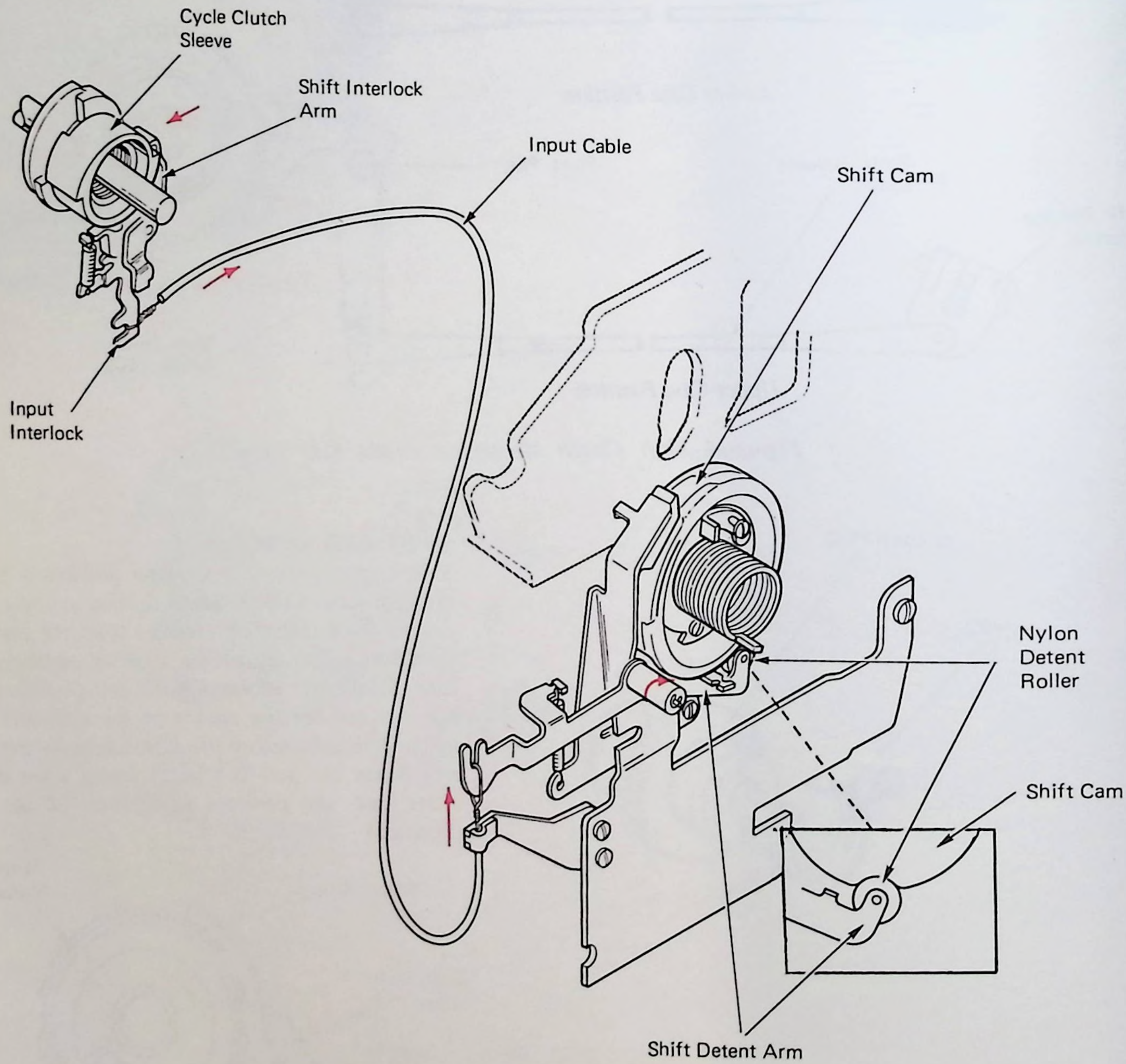


Figure 6 – Shift Detent & Character Interrupter (Level 2)

The level 1 character interrupter mechanism prevented print cycles during a shift operation by blocking the forward movement of the cycle clutch latch link (Figure 7). This is accomplished by rotating a character interrupter pawl into the path of the link with motion taken from the shift detent.

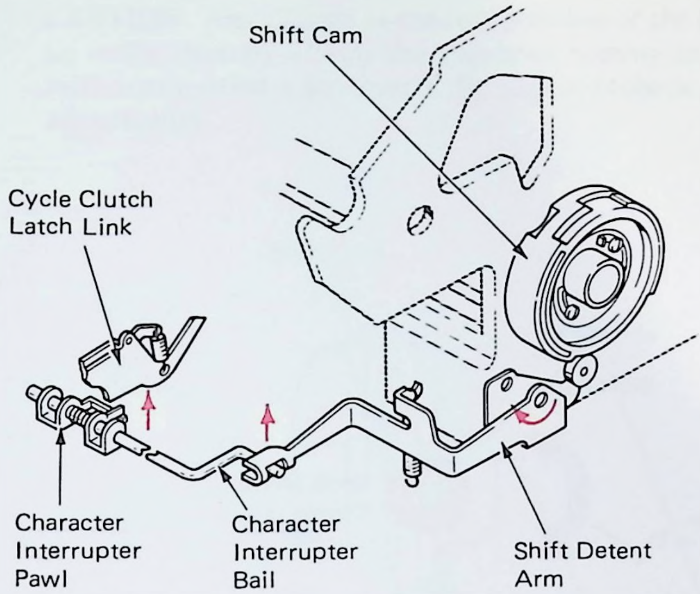


Figure 7 – Shift Interlock (Level 1)

PRINT TO SHIFT INTERLOCK

To prevent operation of the shift mechanism during a print cycle the print-to-shift interlock must be activated (Figure 8). The print to shift interlock operates from a cam mounted to the filter shaft. Each time the filter shaft turns, the shift interlock is positioned into the shift clutch ratchet to prevent a shift operation.

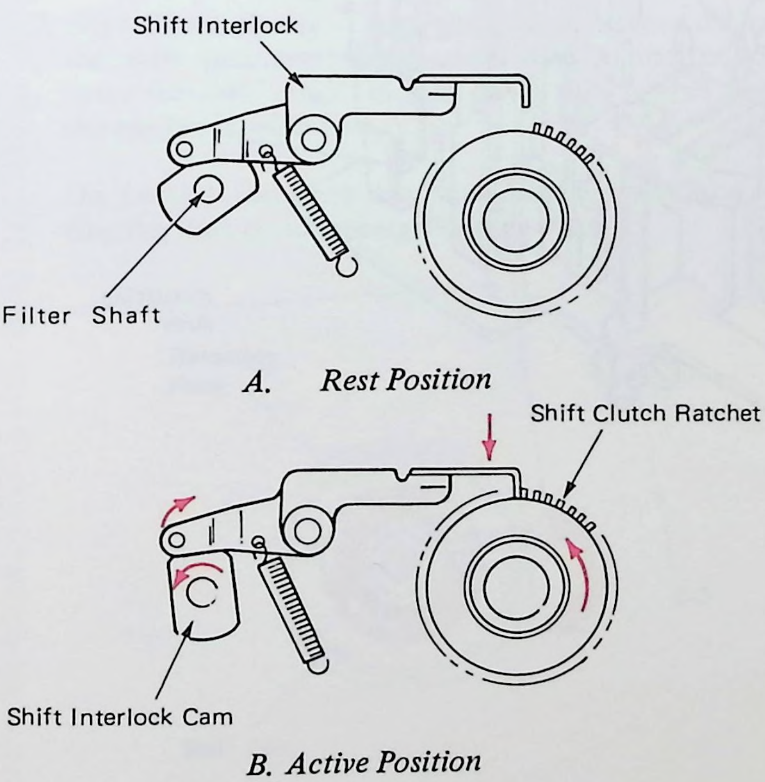


Figure 8 – Print To Shift Interlock (Right Side View)

SHIFT MAGNET OPERATION

When the upper case magnet is energized two things occur (Figure 9). The upper case armature contacts a stud on the shift release arm, pushing the arm to the rear. This releases the shift clutch and a shift operation to upper case takes place. At the same time, the rear of the upper case magnet armature is being latched in its operating position by the lower case magnet armature.

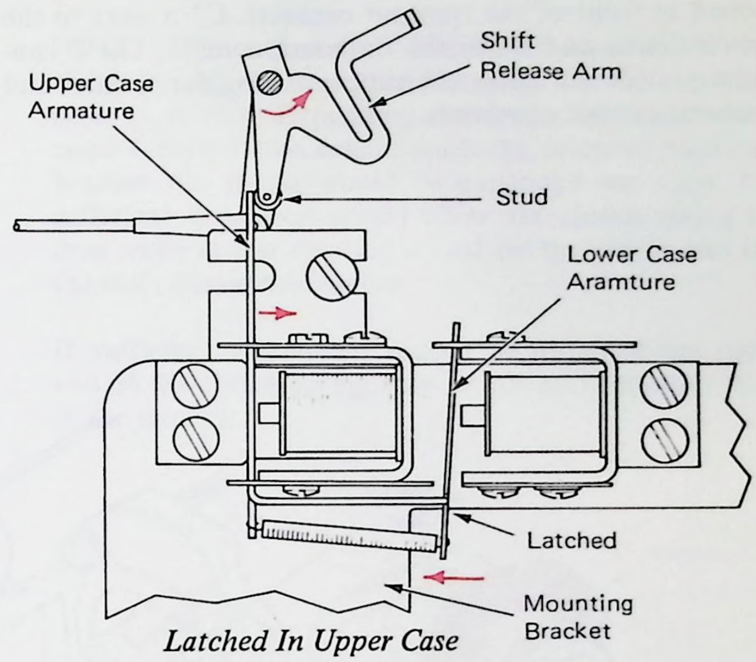


Figure 9 – Shift Magnet Assembly (Right Side View)

Energizing the lower case magnet will cause its armature to move to the rear (Figure 10). This releases the upper case armature and allows the shift mechanism to return to lower case.

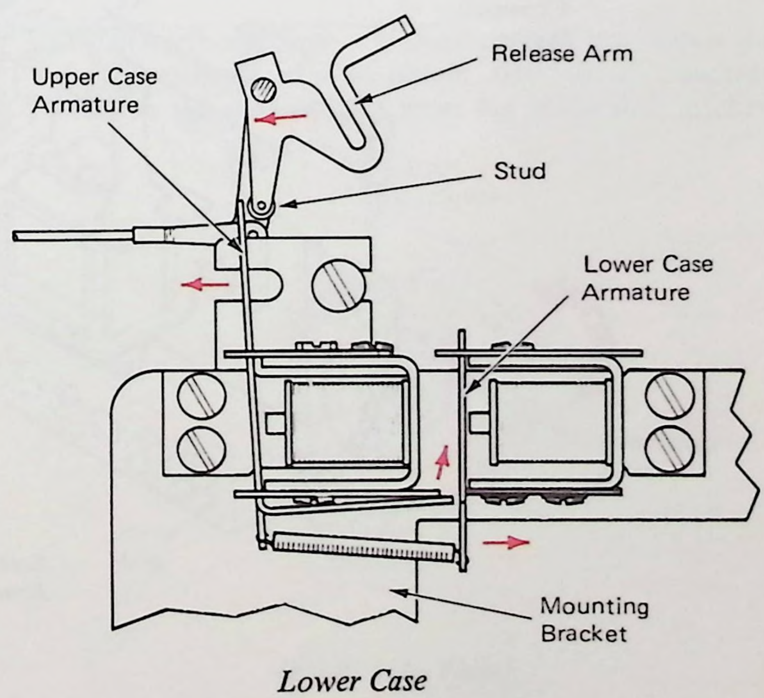


Figure 10 – Shift Magnet Assembly (Right Side View)

SHIFT CONTACTS

Three sets of contacts are used in the shift mechanism (Figure 11). The shift mode contacts are mounted just to the rear of the shift arm. These contacts are activated by a tab mounted on the shift arm. The shift mode contacts provide an electrical indication of which shift case the Selectric I/O is in.

The C3,C4, and shift transmit contacts are mounted just below the shift mode contacts. The C contacts are positioned in front of the transmit contacts. C3 is next to the power frame and C4 is the outboard contact. The C contacts provide (or gate) the proper timing for magnet and transmit contact operation.

The C contacts and the transmit contacts are operated by an arm clamped to the shift cam follower. The cam follower is held against the shift cam by an extension spring. Each time the shift cam rotates the cam follower operates the proper contacts.

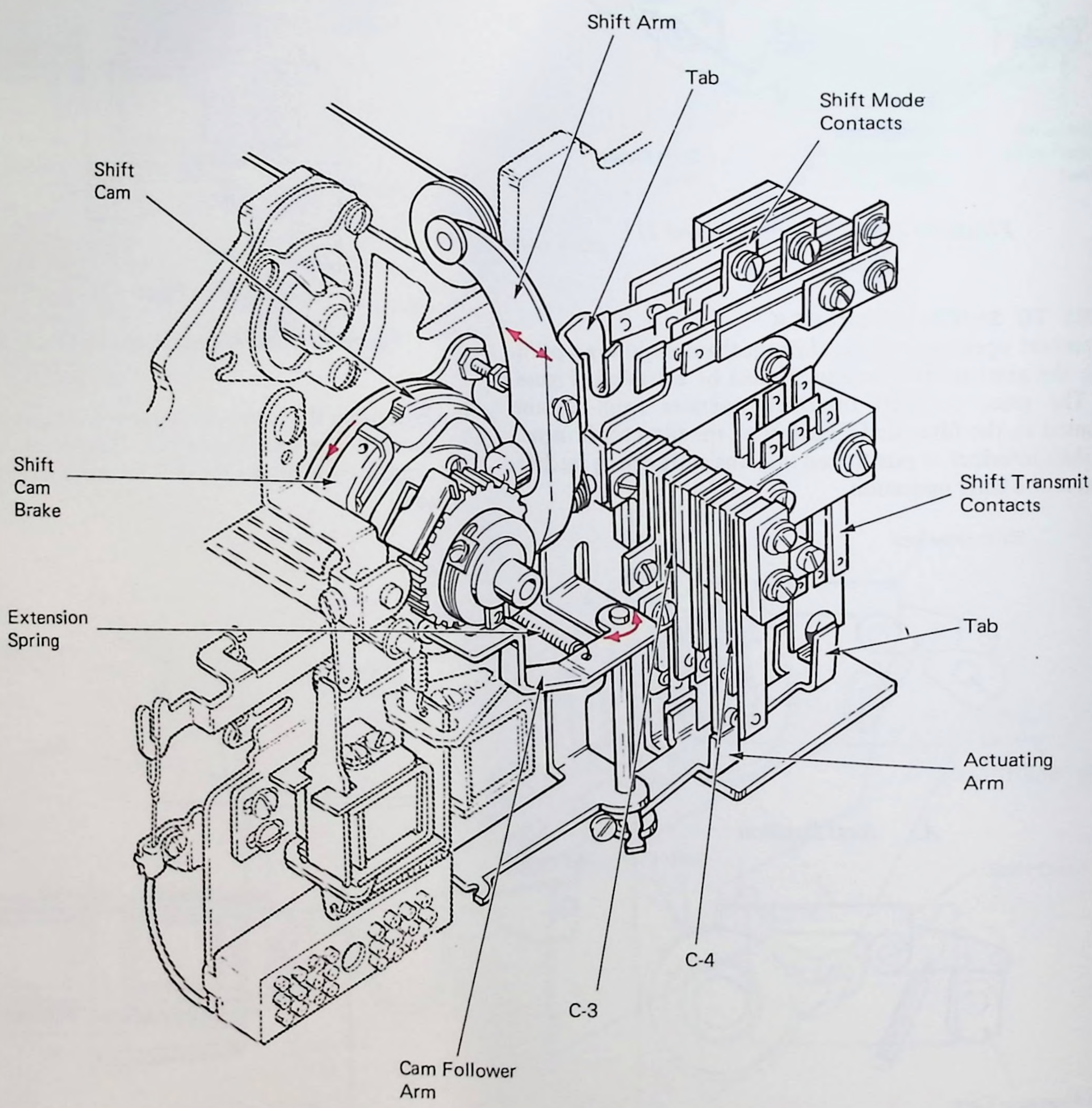
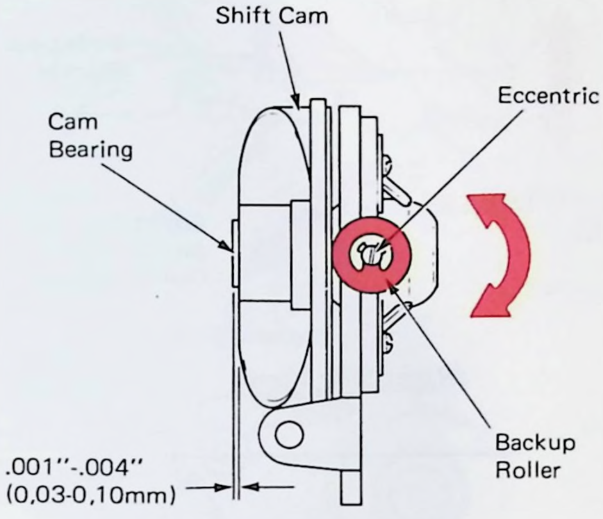


Figure 11 – Shift Contacts

SHIFT ADJUSTMENTS

1. *Shift Cam Backup Roller* – Adjust the backup roller eccentric left to right so .001"-.004" of the cam bearing extends beyond the cam. The eccentric should be kept in the bottom half of its orbit.

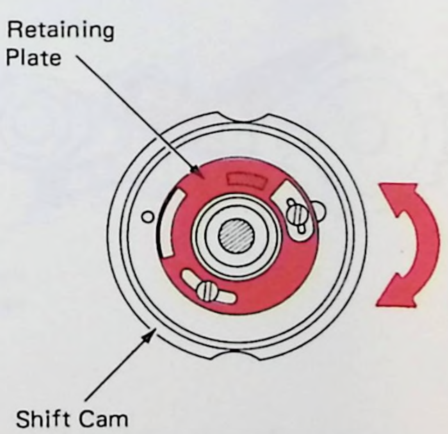
   CAUTION: Any change in the rest position of the back-up roller, directly affects the typehead homing and the shift arm motion adjustments. Be sure to recheck these adjustments.



(Rear View)

2. *Shift Clutch Spring* – With the machine turned off and the shift cam detented in upper case, adjust the machine for .045"-.065" motion of the shift ratchet when the ratchet is released.

   On Level 1 machines this adjustment is made by rotating the shift clutch spring retaining plate.



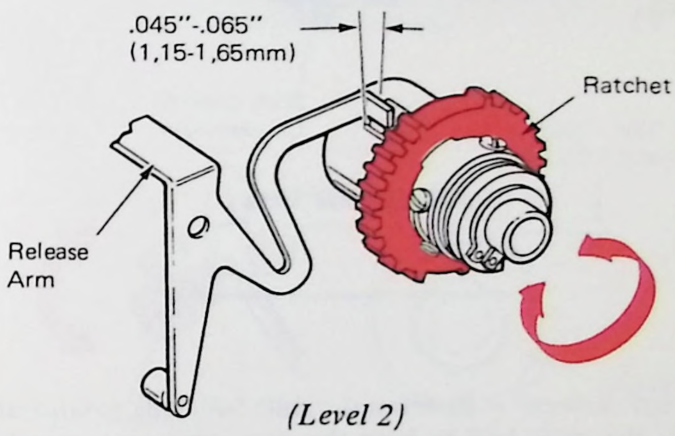
(Level 1 – Right Side View)

On Level 2 machines this adjustment is made by rotating the shift ratchet.

NOTE: A few machines were manufactured with a set-screw, which must be loosened, in addition to the two adjusting screws. Any play in the ratchet should be removed in the clockwise direction.

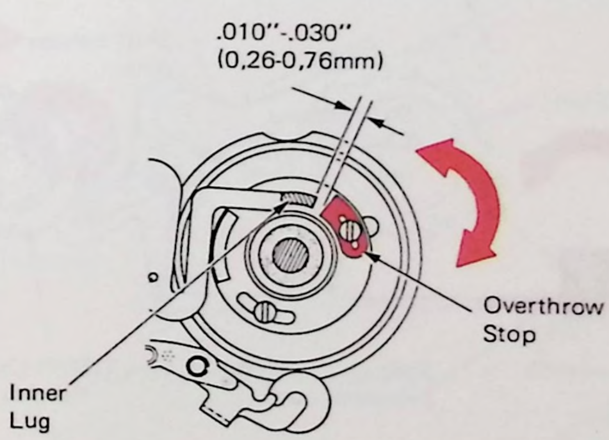
NOTE: This adjustment determines how much the clutch spring will be expanded when the shift mechanism is at rest. Expanding the spring too much may cause failure of the cam to reach the detented position, because the spring would be expanded too soon. Insufficient expansion would allow the clutch spring to drag when at rest creating a load on the motor and on the shift release mechanism.

If sufficient adjustment cannot be obtained the right end of the clutch spring may be placed in another hole in the ratchet.



(Level 2)

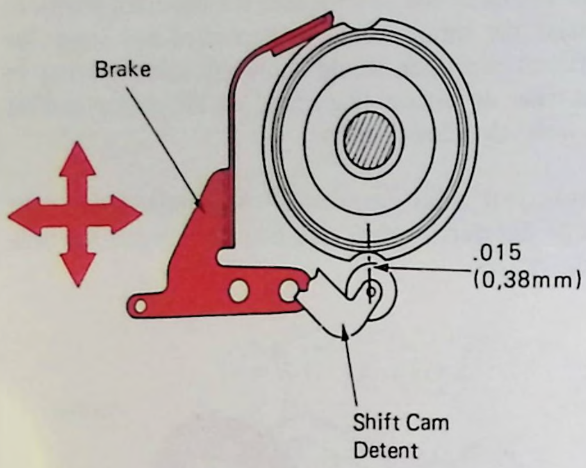
3. *Shift Overthrow Stop* – With all parts at rest, adjust the shift overthrow stop to obtain .010"-.030" clearance between the stop and the inner lug of the shift ratchet.



(Right Side View)

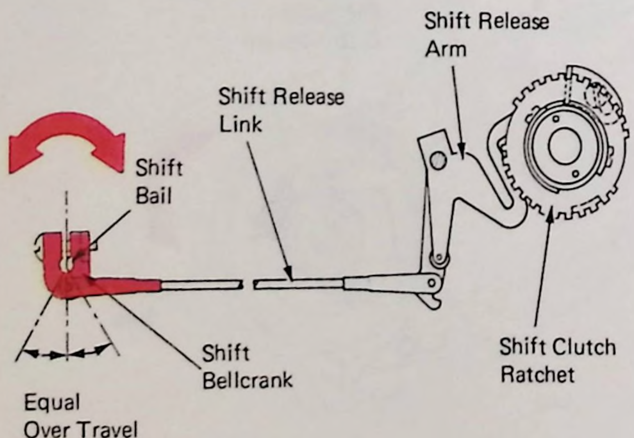
4. *Shift Cam Brake* – Adjust the shift cam brake so that the shift cam will stop in the center of the detent position ±.015", when the detent roller is held away from the cam during the shift from upper case to lower case.

NOTE: Excessive braking action could prevent the cam from reaching the detented position in the lower case. Insufficient braking action would result in a noisy shift operation and expose the mechanism to possible parts breakage.



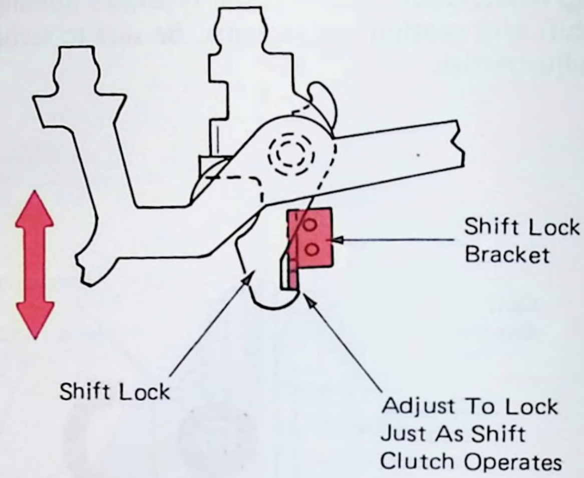
(Right Side View)

5. *Shift Release* – Position the shift bellcrank rotationally on the shift bail to have the same overcenter travel in both directions. Adjust the shift release link so release occurs when the keylever is depressed two-thirds of the way down. As the keylever is allowed to restore from a fully depressed position, the shift should again operate when two-thirds upwards travel of the keylever has been reached. A balance between the two releasing points ensures proper adjustment.



(Right Side View)

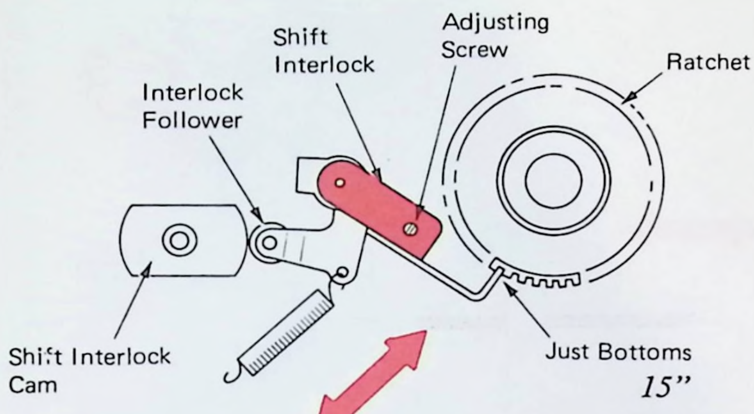
6. *Shift Lock* – Adjust the shift lock bracket vertically so the shift lock engages just as the shift operates or slightly afterward. The lock should not engage before the shift release occurs. The shift lock must be released easily by depressing either shift keybutton.

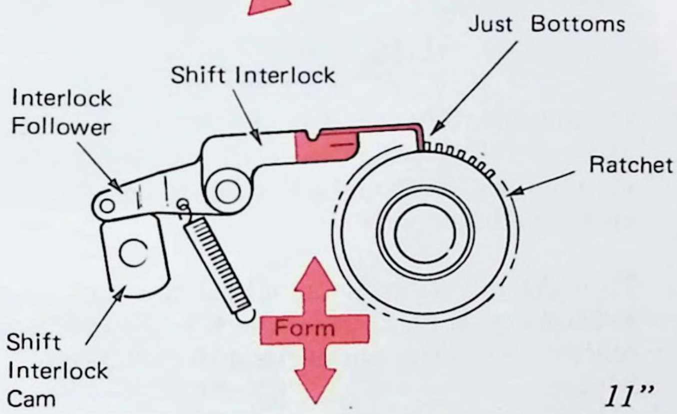


(Right Side View)

7. *Shift Interlock* – The shift interlock must be adjusted to satisfy the following conditions:

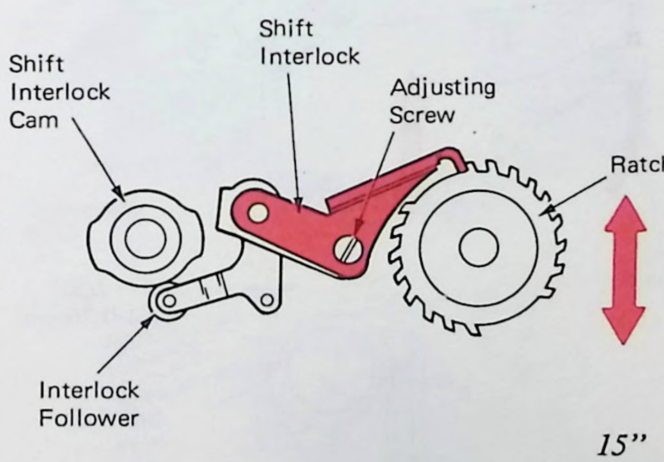
a. Level 1 – When the interlock follower is on the high point of the interlock cam, the tip of the interlock should just bottom between two teeth on the ratchet. Adjust the interlock by its adjusting screw on 15" machines to satisfy this condition or form the interlock on 11" machines.





(Level 1 – Right Side View)

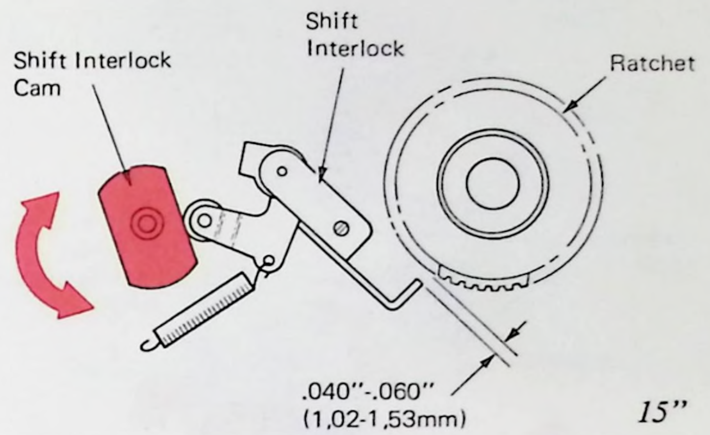
Level 2 – When the interlock follower is on the low point of the interlock cam, the tip of the interlock should just bottom between two teeth on the ratchet. Adjust the interlock by its adjusting screw.

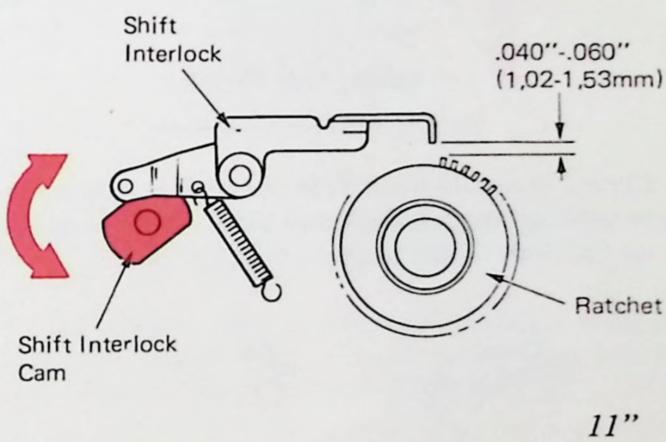


(Level 2 – Right Side View)

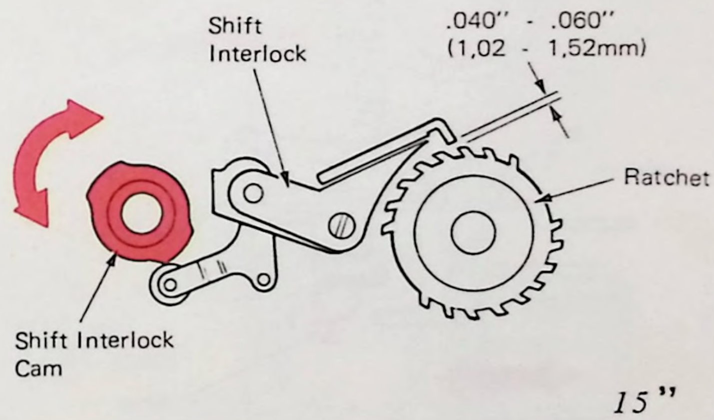
b. With the cycle clutch latched at rest and all backlash of the cycle shaft and filter shaft removed in the operating direction, adjust the shift interlock cam until a clearance of .040"-.060" exists between the tip of the interlock and the top of the tooth on the shift clutch ratchet.

CAUTION: Be sure the interlock cam is in the correct sector of its orbit. This can be checked by tripping the cycle clutch and hand cycling a character. The interlock must move toward the shift ratchet immediately.





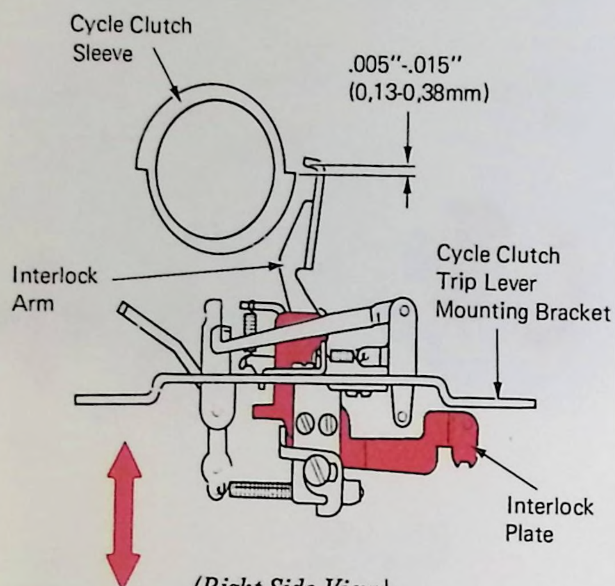
(Level 1 – Right Side View)



(Level 2 – Right Side View)

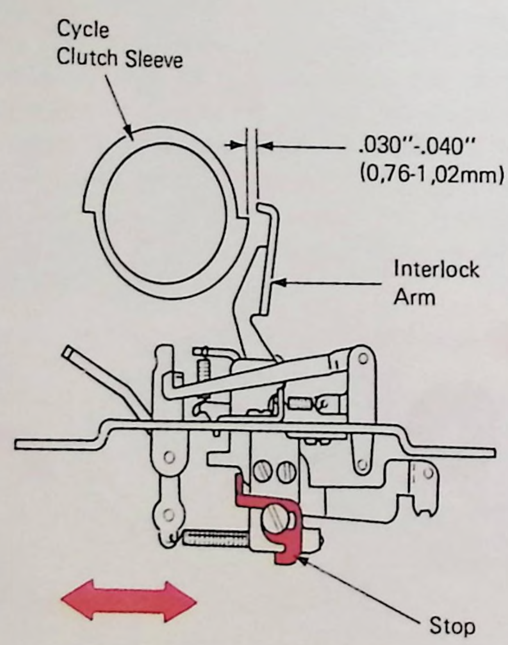
8. *Cycle Clutch Interlock Arm Plate (Level 2)* – Raise or lower the interlock plate so that the interlock arm clears the step on the cycle clutch sleeve by .005"-.015".

NOTE: When adjusting the plate, exercise care to prevent the mounting plate from rotating about the mounting screws. Keep the mounting plate parallel to the cycle clutch trip lever mounting bracket. Failure to do so may cause cycle clutch lock-up due to failure of the interlock arm to restore.



(Right Side View)

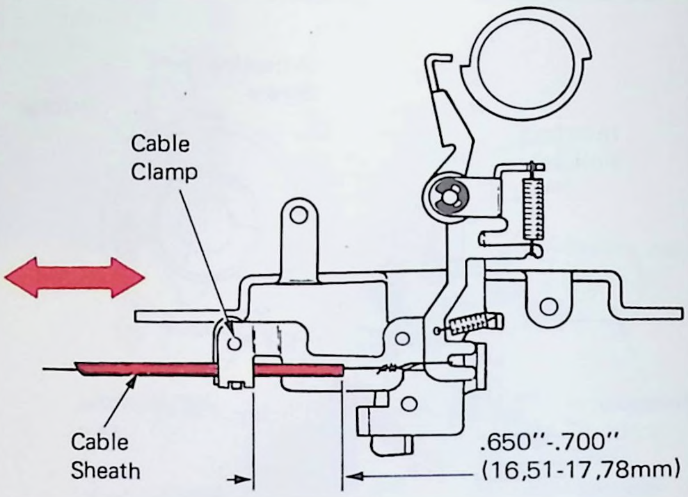
. *Cycle Clutch Interlock Stop (Level 2)* – Adjust the stop to position the interlock arm .030"-.040" from the step on the cycle clutch sleeve.



(Right Side View)

10. *Cycle Clutch Interlock Cable Sheath* –
   a. Position the cable sheath so that .650"-700" extends beyond the cable clamp on the cycle clutch interlock arm plate.

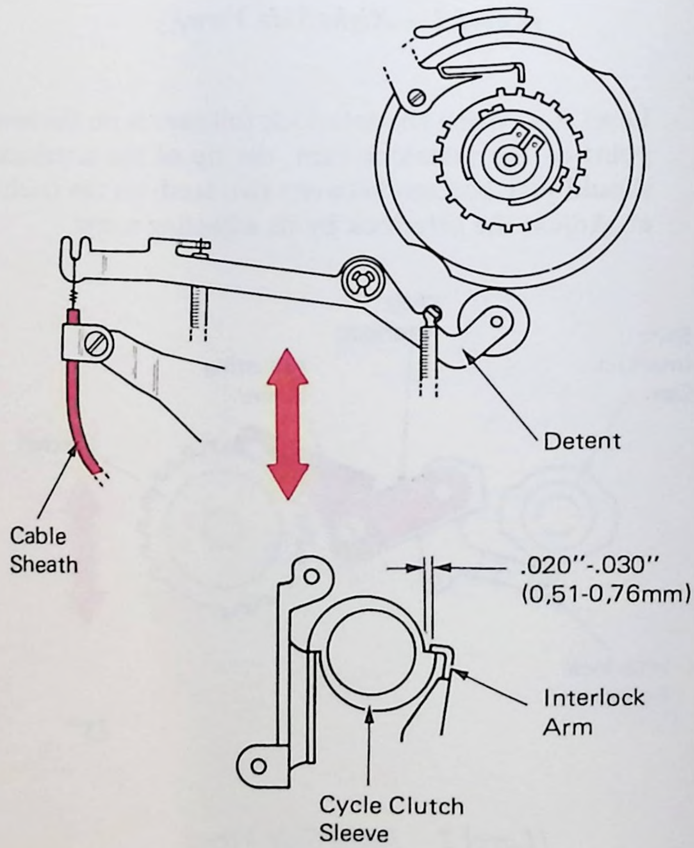
NOTE: When the shift detent roller restores into the shift cam detent, the cable loop should be a minimum of .030" from the cable sheath at the cycle clutch trip lever bracket end.



(Left Side View)

   b. Position the cable sheath at the shift detent end, for .020"-.030" clearance between the front edge of the interlock arm and the bottom of the step on the cycle clutch sleeve.

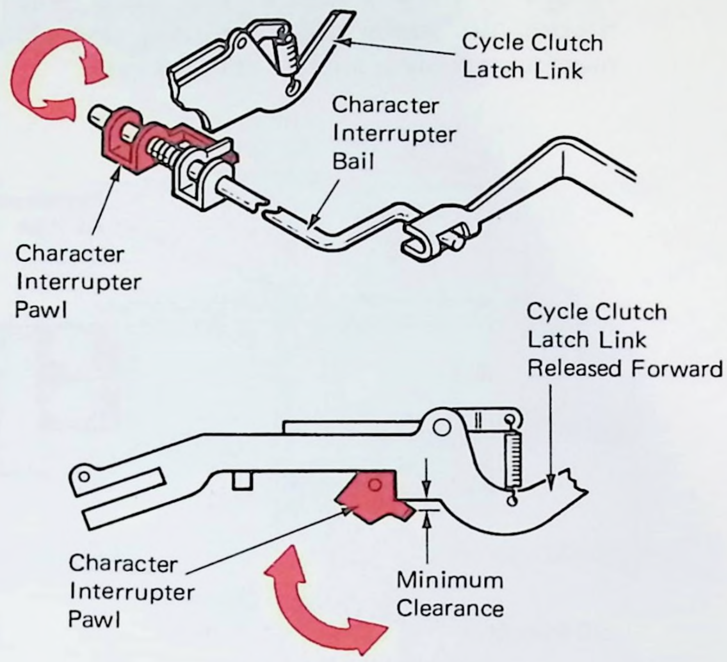
   To make this adjustment, release the shift ratchet and hand cycle the shift cam so that the shift detent roller is completely out of the shift cam detent.



(Right Side View)

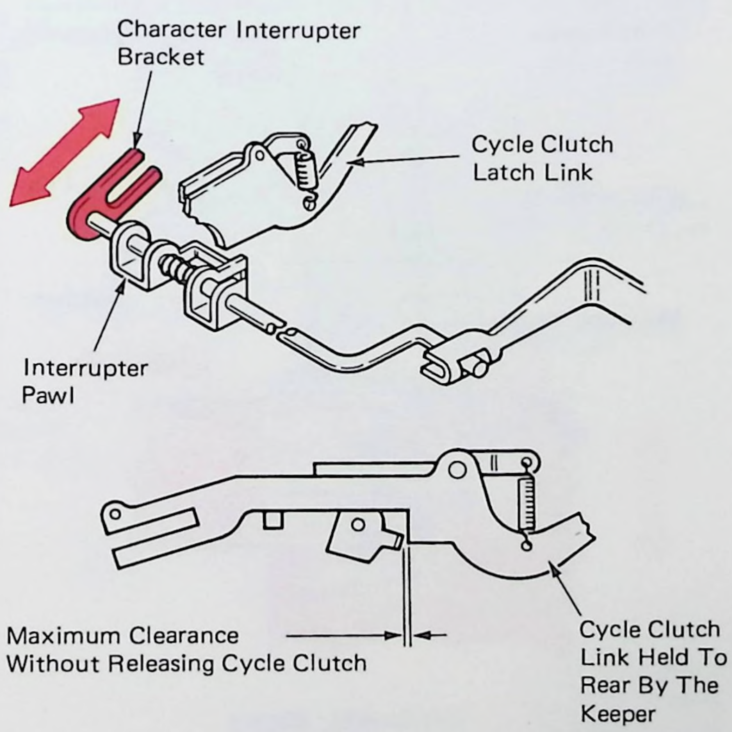
11. Shift To Print Interlock (Level 1 Only) – Adjust the interlock to satisfy the following conditions:

a. Adjust the character interrupter pawl radially on the interrupter bail for minimum clearance between the interrupter pawl and the cycle clutch latch link when the cycle clutch latch link is in the released position and the shift is at rest.



(Right Side View)

b. With the character interrupter pawl actuated, adjust the character interrupter bracket front to rear to obtain maximum clearance between the interrupter pawl and the cycle clutch latch link when the shift is partially operated. This clearance should not be wide enough to allow the cycle clutch to trip.

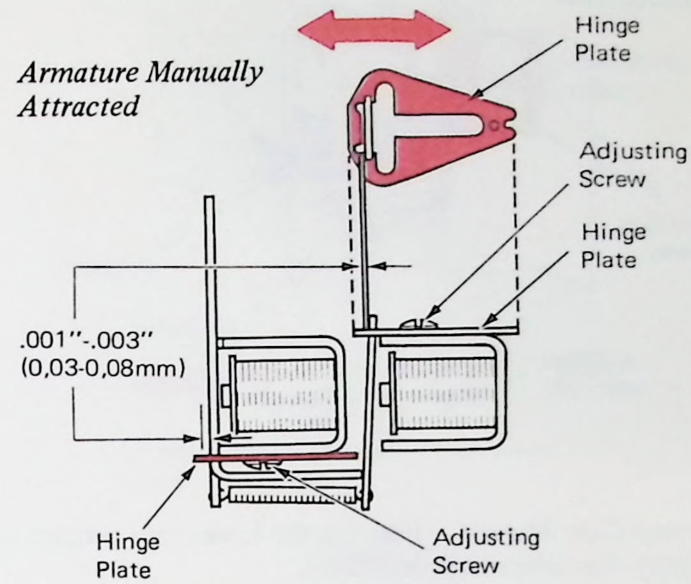


(Right Side View)

---

12. Hinge Plates – Position the hinge plates with the armatures manually operated to obtain .001"-.003" clearance between the armatures and hinge plates.

This clearance ensures free operation of the armature. With no clearance and oil on the two surfaces, the armature would have a sluggish operation. Excessive clearance may cause slow operation due to the relationship between the magnetic field and armature.

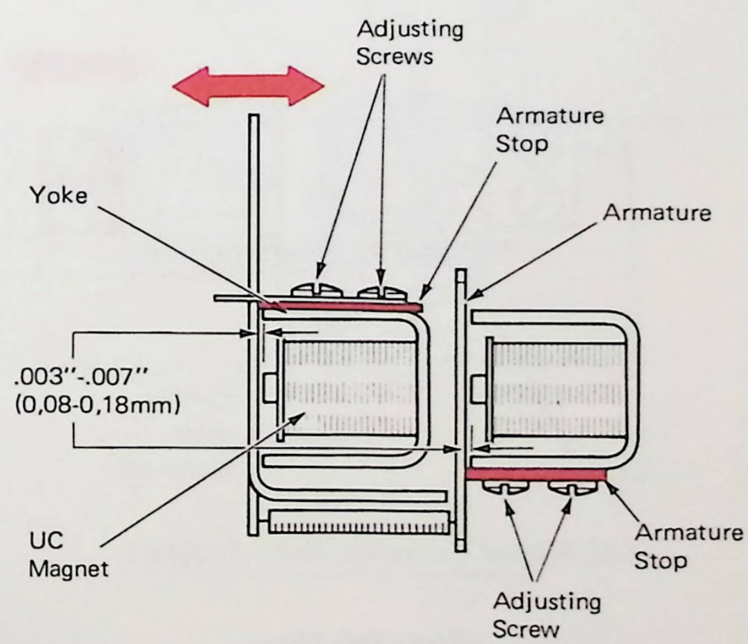


(Right Side View)

---

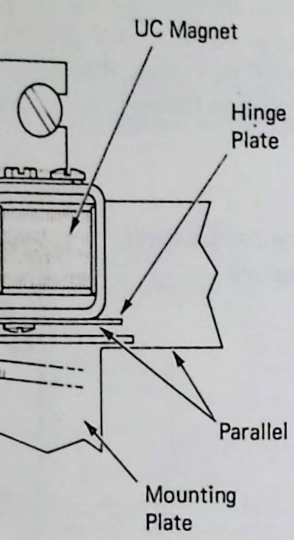
13. Armature Stops – Position (magnets energized) so that the armatures clear their yokes by .003"-.007".

The adjustment ensures that the armature will not touch the magnet core. If an armature does touch a core it may be held by residual magnetism.



(Right Side View)

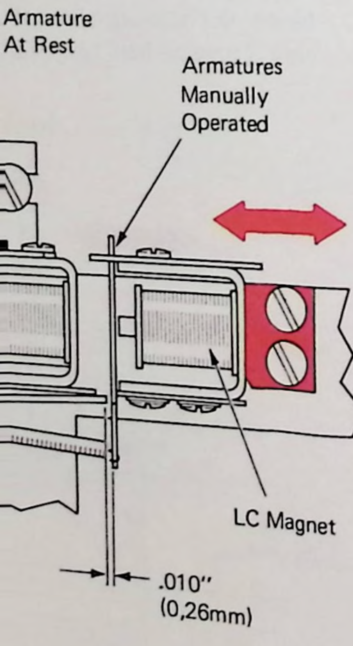
Position so that its mounting
n the elongated holes with the
th the assembly mounting plate.



t Side View)

Position the lower case magnet to
onditions:

th the lower case armature held
upper case armature at rest, the
ure should clear the upper case
". This clearance ensures positive
pper case armature.

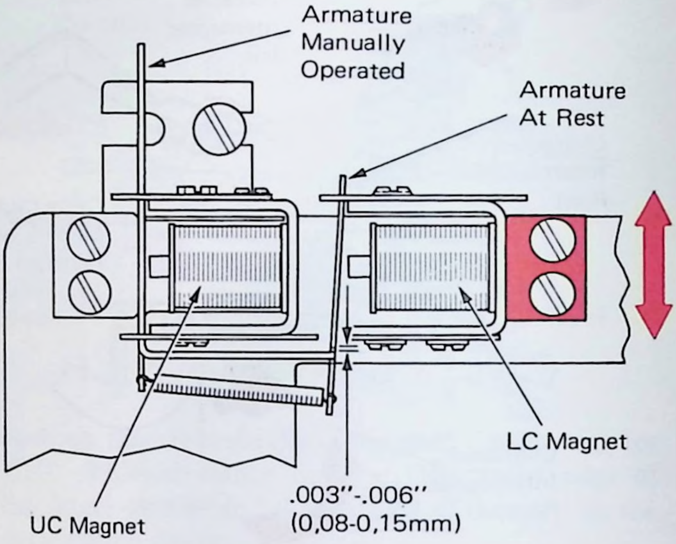


mbly (Front To Rear)

t Side View)

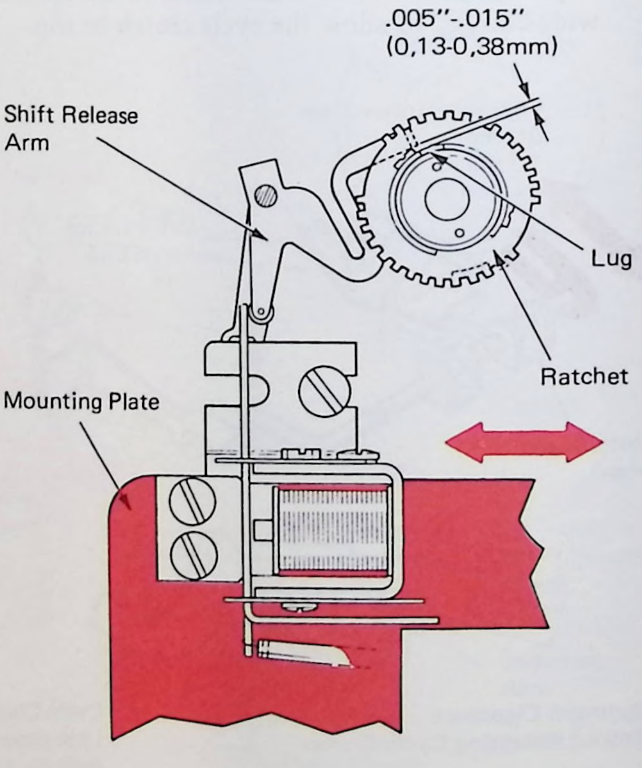
b. Vertical – With the upper case magnet held operated, adjust the lower case magnet up or down so a clearance of .003"-.006" exists between the latching surface of the lower case armature and the upper case armature.

When the upper case armature is picked the lower case armature must be able to snap forward and latch the upper case armature. If the clearance is excessive the upper case armature may move far enough to allow a shift to take place. When this happens the printer will be in lower case while the magnet assembly is latched in upper case.



(Right Side View)

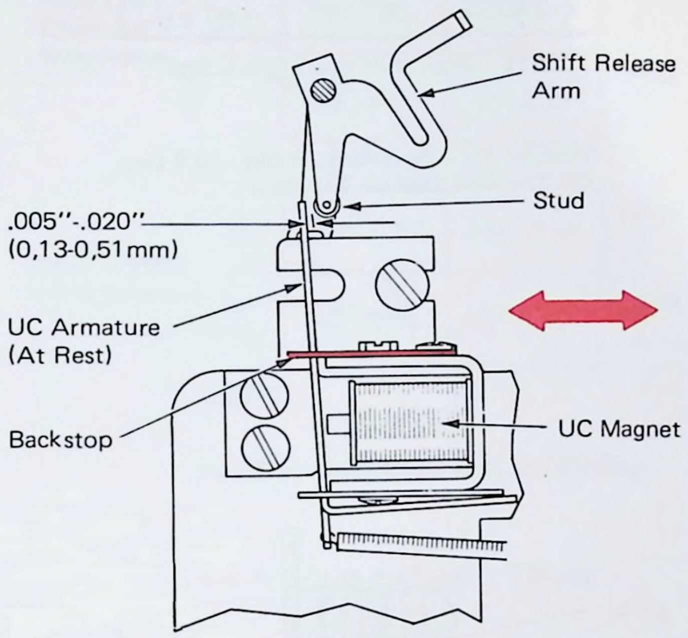
16. *Shift Magnet Assembly* – Position the magnet assembly mounting plate (UC armature energized) so that the release arm clears the shift ratchet lug by .005"-.015".



(Right Side View)

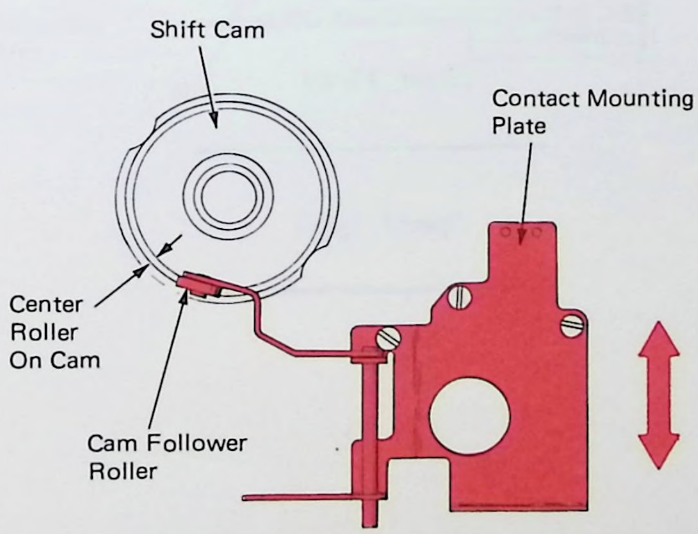
17. *UC Armature Backstop* – Position the upper case armature backstop so that the UC armature clears the release arm stud by .005"-.020".

NOTE: The clearance between the UC armature and shift release arm allows the armature to be in motion prior to picking up the load of the release arm. With no clearance the armature may fail to pick. Oil on these parts could cause the UC armature to follow the release arm and latch in upper case, when the release arm is operated manually. The electronic device may not be able to correct this condition.



(Right Side View)

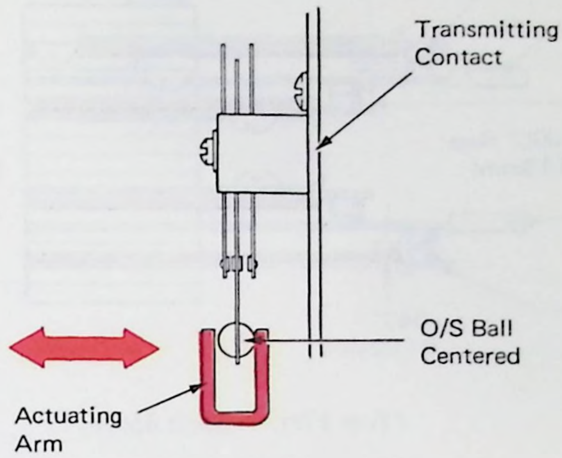
18. *Contact Mounting Plate* – Position the contact mounting plate vertically so that the cam follower roller is centered on the shift cam.



(Right Side View)

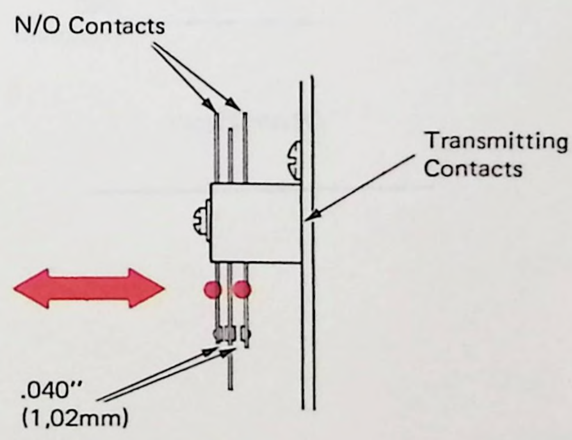
19. *Contact Actuating Arm* – Position the contact actuating arm so that the O/S ball of the shift transmit contact is centered between the actuating arm tabs.

NOTE: Make this adjustment with the cam follower roller held against the detented shift cam.



(Rear View)

20. *Transmit Contacts* – Form the N/O points of the shift transmit contacts to clear the O/S by .040".

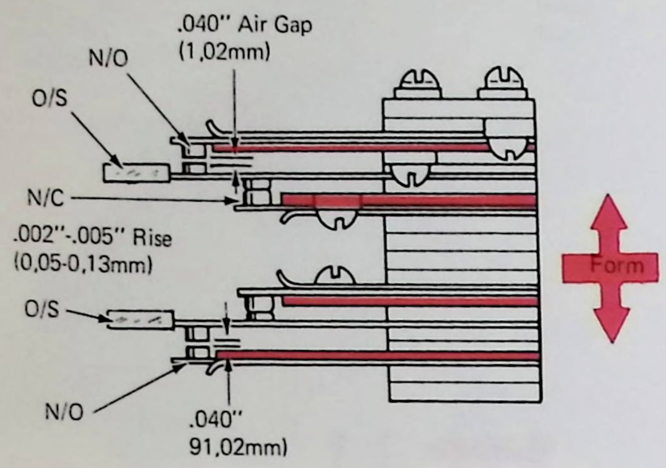


(Rear View)

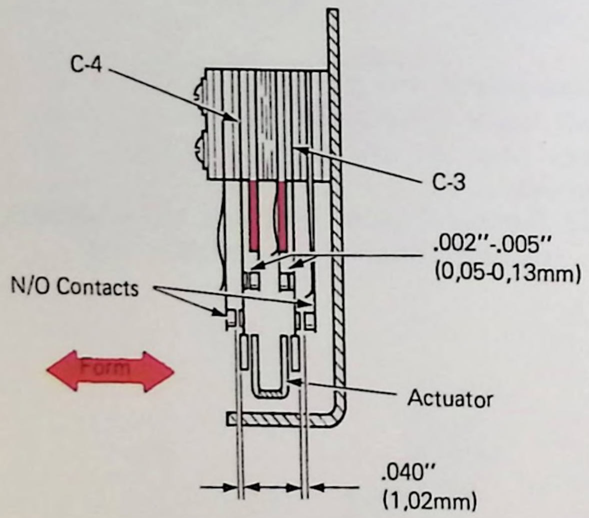
21. *C3, C4 and Shift Mode Contacts* – Adjust the C3, C4 and shift mode contacts to satisfy the following conditions:

a. Form the N/C contact supports so that the O/S's lift the N/C contact straps .002"-.005".

b. Form the N/O contact supports so that the N/O contacts clear the O/S's by .040".



(Top View – Shift Mode)



(Rear View)

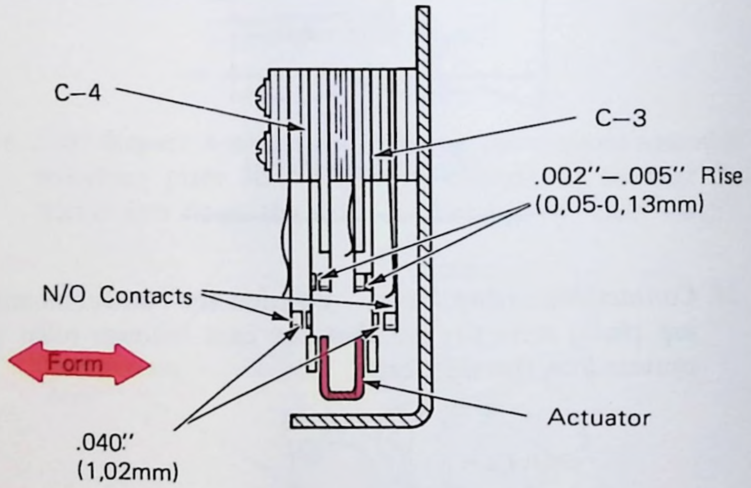
22. *Actuating Arm Tabs* – Form the actuating arm tabs so both the C3 and C4 N/O contacts receive an equal amount of motion through 360 deg. of shift cam rotation, and meet timing chart specifications.

TIMING CHART (C-3 & C-4)

Shift	N/O Make	N/O Break
C-3 & C-4	35° ±5	145° ±5

NOTE: Each shift operation is 180°

Transfer Time Should Be 3 Deg. To 9 Deg. On The Rise Side Of The Cam



(Rear View)

23. *Mode Contact Actuating Arm* – Form the tabs on the shift mode actuating arm to transfer the contacts at the times indicated in the timing chart.

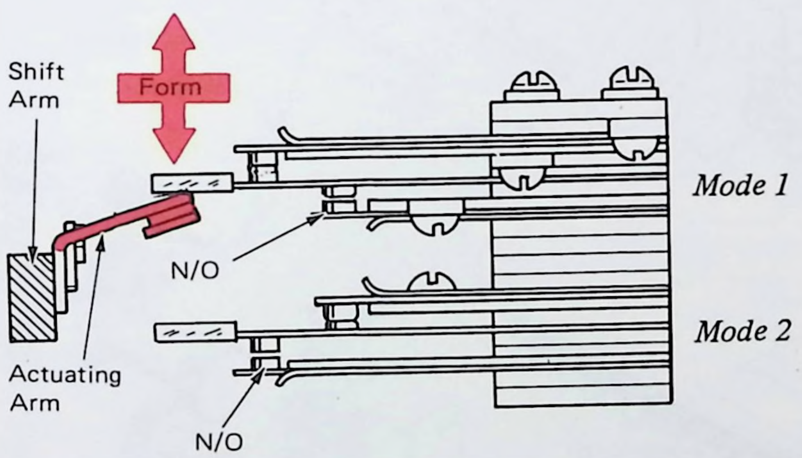
Shift mode is transferred when shifting from upper case to lower case. Shift mode 2, and in the case of MT/ST mode 3, is transferred when shifting from lower case to upper case.

	N/O Make	N/O Break	
With Level 1 Character Interrupter	80° ± 10	100° ± 10	Mode 1
	130° ± 10	50° ± 10	Mode 2

With Level 2 Shift Interlock	100° ± 10	120° ± 10	Mode 1
	130° ± 10	87° ± 10	Mode 2

Note: Each Shift Operated Is 180 Deg.

Form For Proper Contact Timing



(Top View)

The purpose of the character selection mechanism is to position the typehead in the desired character or symbol position for printing (Figure 1). At rest, the position of the typehead is such that the middle character of the upper band is in position to strike the platen. If any other character is desired, the typehead must be tilted and/or rotated.

The character selection mechanism consists of two sub-mechanisms: tilt selection, and rotate selection. The tilt and rotate mechanisms transfer motion through their tape systems to tilt and rotate the typehead. The keyboard (see Keyboard Operational theory) initiates the selection for the amount of tilt and rotate motion needed for each individual character.

The components of the character selection mechanism covered in this section only tilt and rotate the typehead to the approximate character position. This is referred to as coarse alignment. Further positioning and locking of the typehead prior to printing is referred to as fine alignment and is covered in the Fine Alignment Section of this manual.

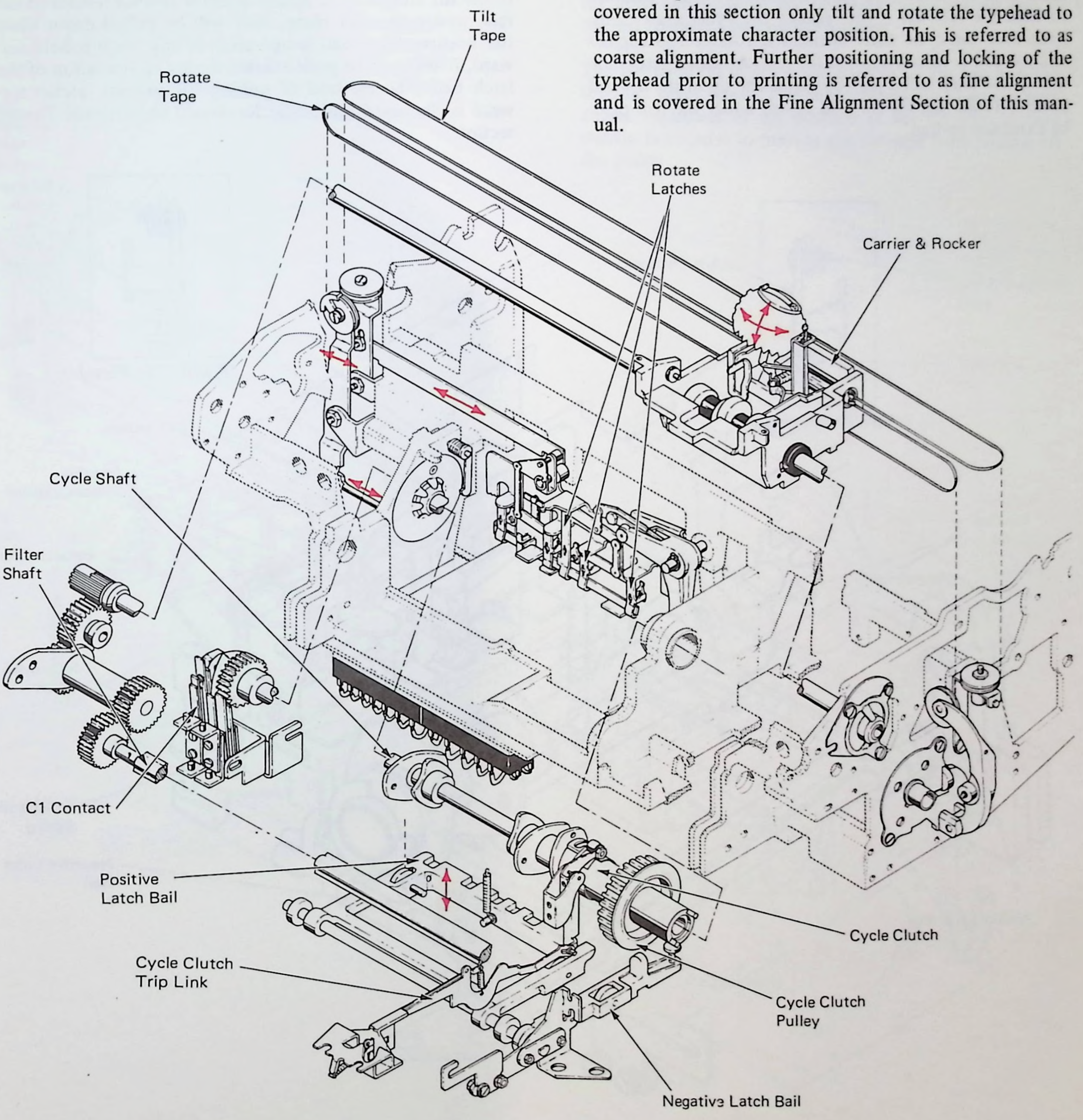


Figure 1 – Character Selection (Input)

CYCLE SHAFT & LATCH BAIL

Drive is transmitted to the tilt and rotate mechanisms through three double lobed cams on the cycle shaft, the positive latch bail and the negative latch bail (Figure 2). The two positive cams operate as a pair to control the positive latch bail. The negative cam controls the negative latch bail.

The positive latch bail is a box-shaped frame which pivots on the bail shaft at the front. Located at each side of the latch bail is a cam follower roller. An extension spring, at the rear of the latch bail, applies constant upward pressure to hold the follower rollers against the cycle shaft cams. Each time the cycle shaft operates it rotates 180 degrees and the bail is forced down at the rear. Attached across the rear of the latch bail is the bail plate. The tip of the tilt and positive rotate latches are held at rest under the bail plate by extension springs.

The negative latch bail differs from the positive latch bail in that it rises when the cycle shaft rotates, but only if the negative 5 latch is pulled forward. This will be discussed further, later in this section.

The selector latches, which are components of the rotate and tilt mechanisms, determine how much rotate and tilt motion the typehead will receive. The two latches to the left are concerned with tilting the typehead, while the four on the right deal with rotating the typehead.

If the tilt and positive rotate selector latches remain to the rear, under the bail plate, they will be pulled down when the positive latch bail is operated. If any latch is held forward, it will not be pulled down during an operation of the latch bail. The method of pulling the various latches forward is discussed under the Keyboard Operational Theory section.

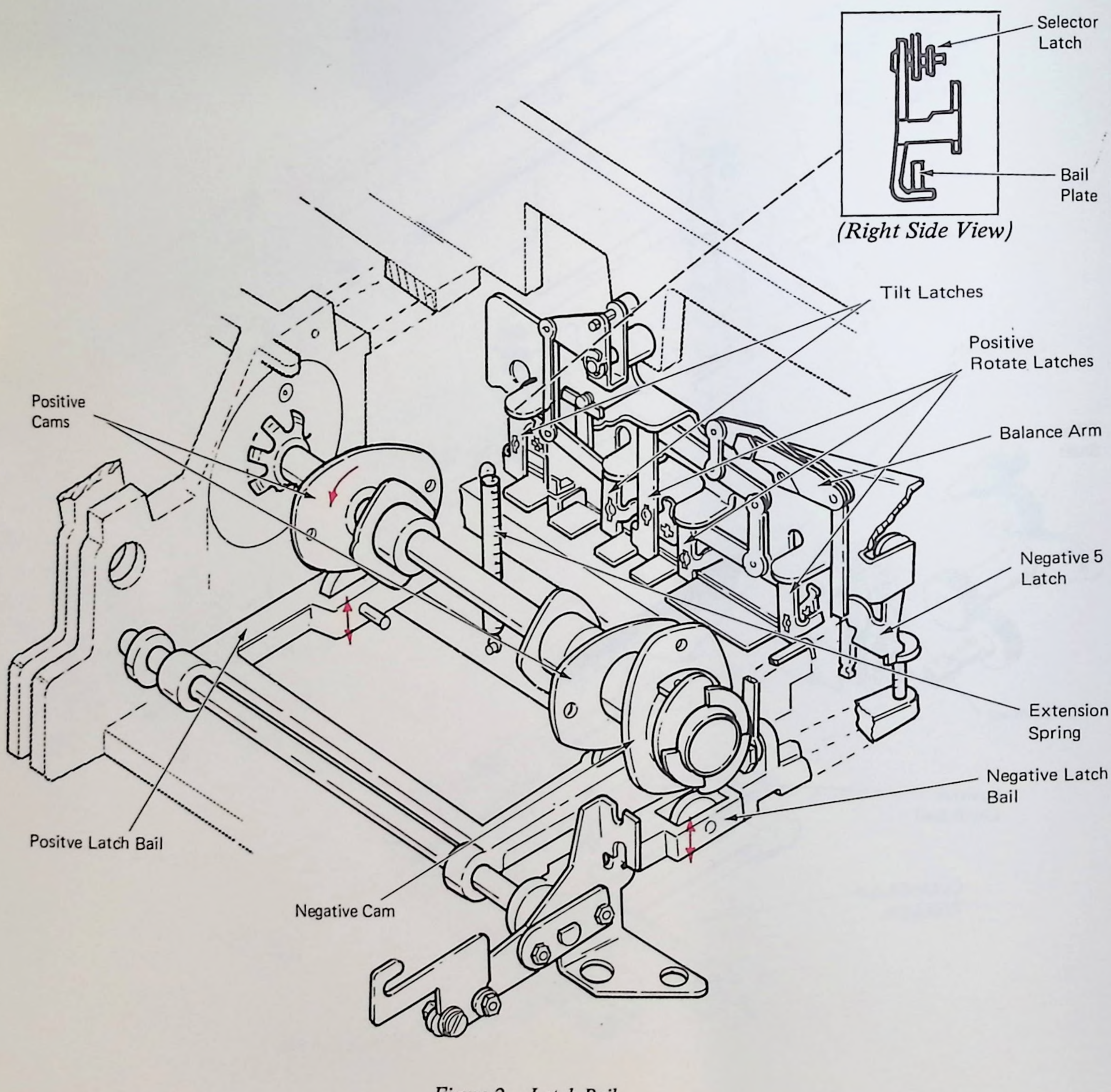


Figure 2 – Latch Bail

TILT MECHANISM

The purpose of the tilt mechanism is to position the typehead vertically to any of the four character bands. This is accomplished by transferring motion from the latch bail through a latch assembly, tilt arm, tilt tape, tilt bellcrank and a tilt ring to tilt the typehead.

TILT DIFFERENTIAL

Two tilt latches are attached at each end of a short lever by ball shouldered rivets (Figure 3). The ball shape of the shoulders allow the latches to pivot in all directions. The lever is attached by a double vertical link to a bellcrank. The bellcrank pivots on a stud at the top of the differential bracket. The connection of the double vertical link is not in the middle of the lever, but is offset so the leverage developed by one tilt latch is twice that of the other.

A horizontal link connects the top of the bellcrank to the tilt arm. Operation of the bellcrank forces the tilt arm to the left to exert a pull on the tilt tape.

The left hand tilt pulley is mounted to the tilt arm on a ball shoulder pivot screw. This allows the pulley to remain horizontal regardless of the position of the tilt arm. It must remain horizontal to prevent the tilt tape from coming off the pulley.

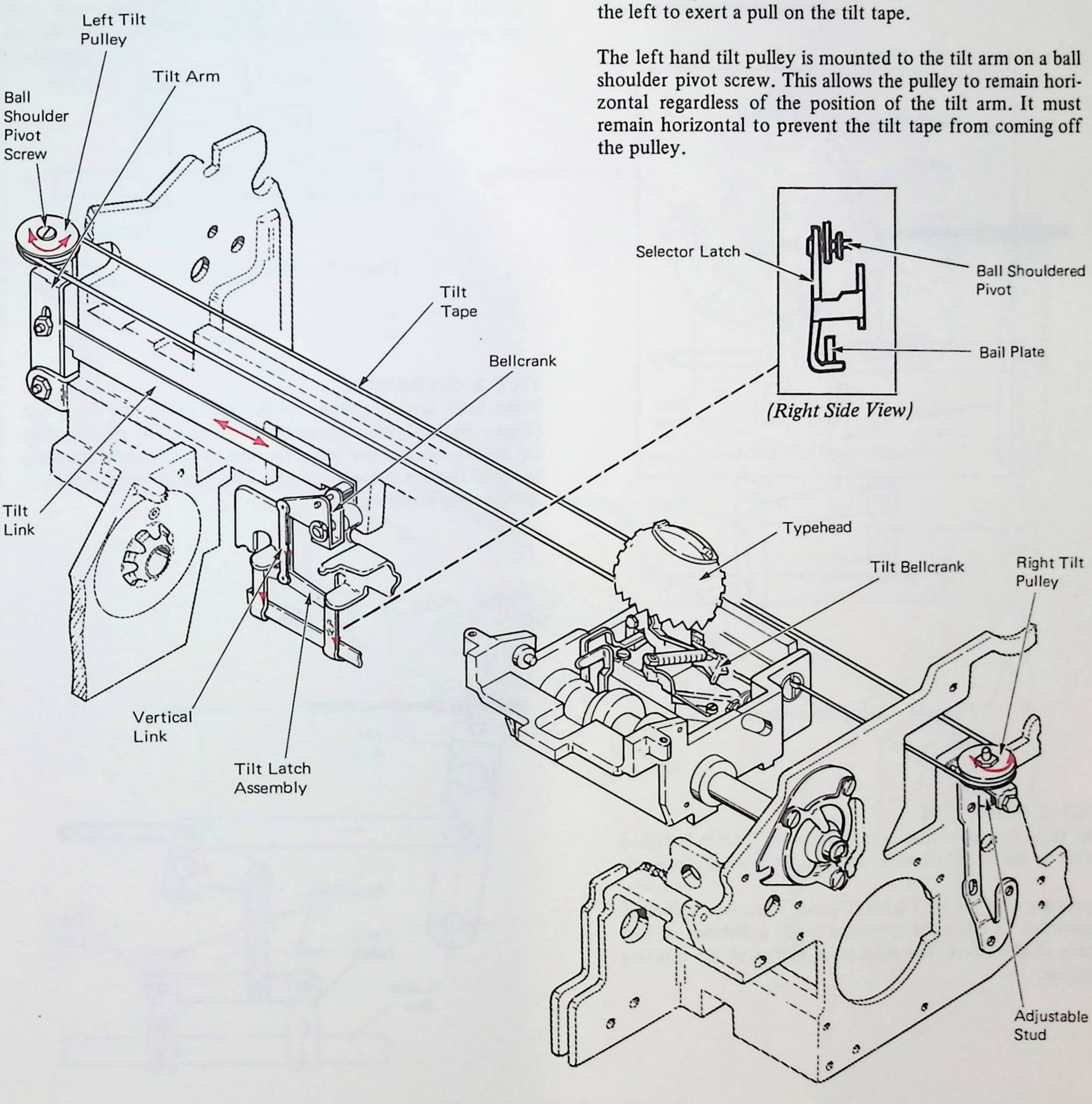


Figure 3 – Tilt Selection Mechanism

TILT 1 OPERATION

The tilt arm is rotated by a pull on the tilt latches. When the tilt 2 latch is held to the front while the tilt 1 latch remains to the rear, only the tilt 1 latch is pulled down by the positive latch bail (Figure 4). As the latch pulls down on the lever, the left end of the lever pivots against a stop pad formed out from the differential bracket. The vertical link from the lever is then pulled to operate the tilt mechanism. This causes the typehead to tilt a distance of one band of characters, and places the second band from the top in the printing position.

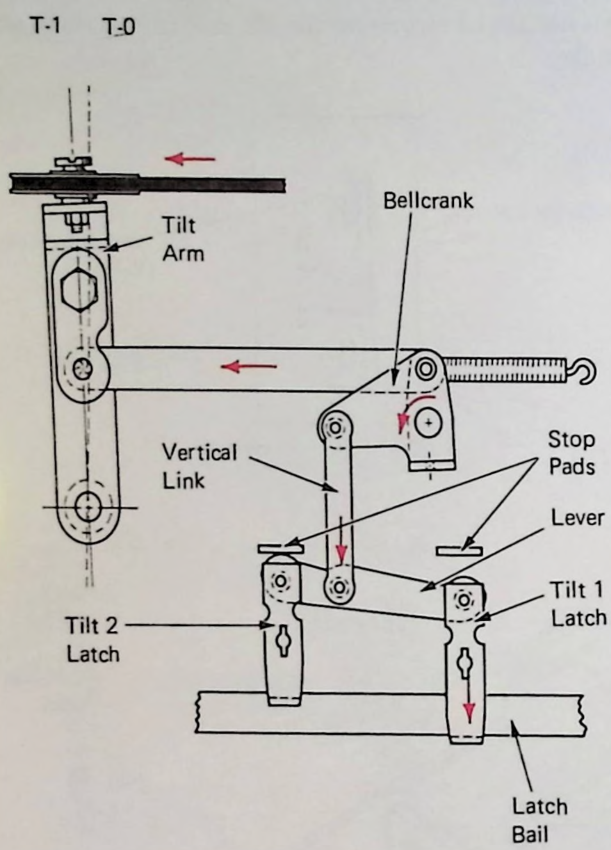


Figure 4 – Tilt 1 Operations

TILT 2 OPERATION

The same type of action occurs if the tilt 2 latch is pulled down by the latch bail while the tilt 1 latch is held forward.

Operating only the tilt 2 latch (Figure 5) develops sufficient movement to cause the typehead to tilt a distance of two bands of characters. The third band is then in the printing position.

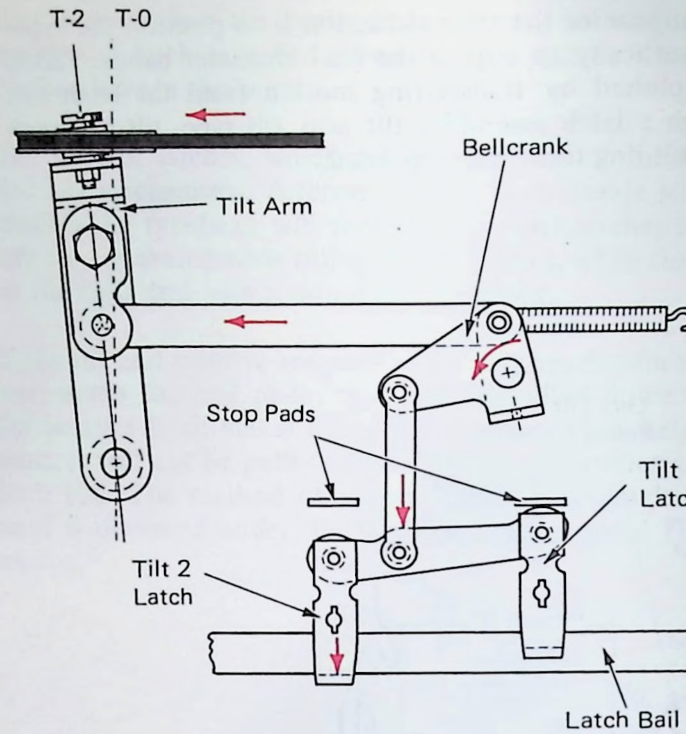


Figure 5 – Tilt 2 Operation

TILT 3 OPERATION

When both latches remain to the rear under the latch bail (Figure 6), both are operated. This causes the double vertical link to receive the same motion as the latches, resulting in three character bands of tilt. The fourth band is then in the printing position.

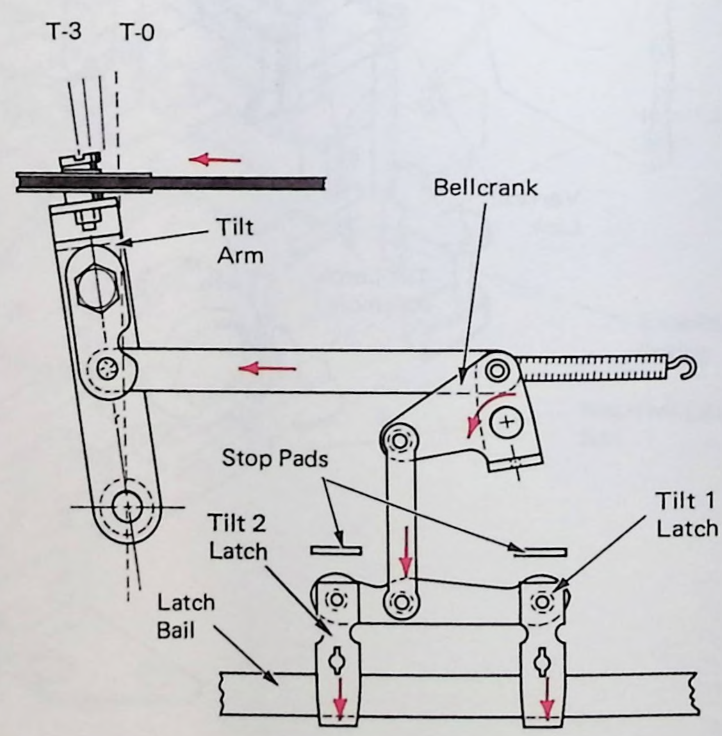


Figure 6 – Tilt 3 Operation

GEARLESS TILT (LEVEL 2)

Mechanical motion of the tilt differential is transferred to the typehead through the tilt tape (Figure 7). The tilt tape is connected to the tilt bellcrank on the rocker assembly, extends to the left around the tilt arm pulley, back to the right around the right hand tilt pulley, and is attached to the right side of the carrier. This arrangement allows left to right movement of the carrier without disturbing the tilt position of the typehead.

The right hand tilt pulley is solidly mounted and is moved for adjustment only. The tilt arm pulley moves with the tilt arm. Movement of the tilt arm to the left exerts a pull on the tilt tape, thus rotating the tilt bellcrank and causing the typehead to tilt.

TILT RING

From the tilt tape and bellcrank, mechanical motion is transferred through a link to the tilt ring (Figure 7). The tilt ring pivots on two pins between the yoke arms, inside the hollow part of the typehead. A pull on the tilt tape causes the tilt ring to pivot about its pins, thus, tilting the typehead. Because the typehead rests with the upper band of characters in the print position, all tilt operations are upward from the rest position. The tilt ring is restored to rest by an extension spring which connects to the tilt bellcrank.

NOTE: The tilt ring is discussed further in the Fine Alignment section of this manual.

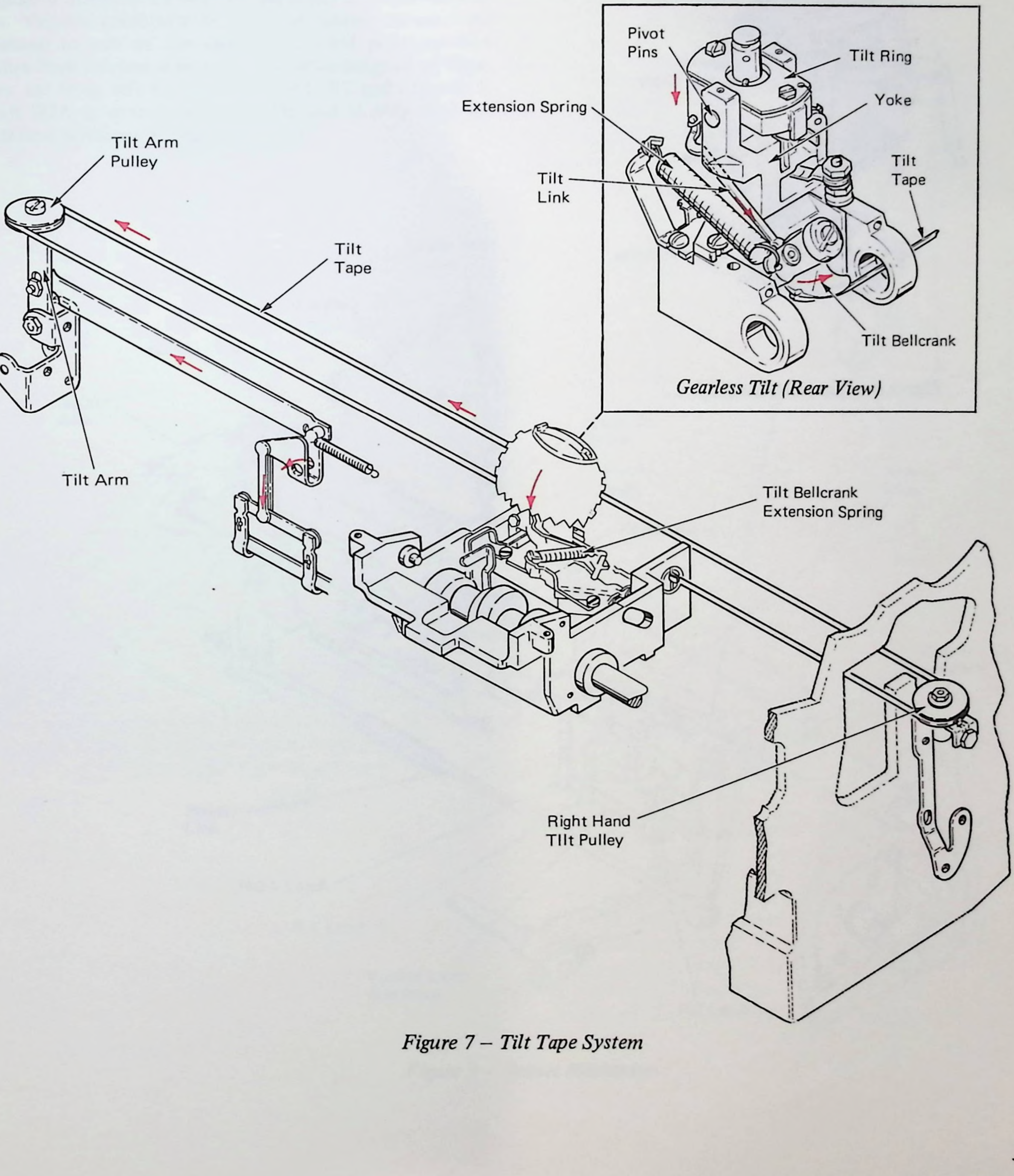


Figure 7 – Tilt Tape System

GEAR TILT (LEVEL 1)

The Level 1 mechanism uses a pair of beveled sector gears, a tube, and a pulley to control the tilt ring (Figure 8). As the tape is pulled, it rotates the tilt pulley which in turn rotates the tube. A sector gear is mounted to the tube and is engaged with the tilt ring sector gear. Therefore, when the tube rotates the tilt ring tilts.

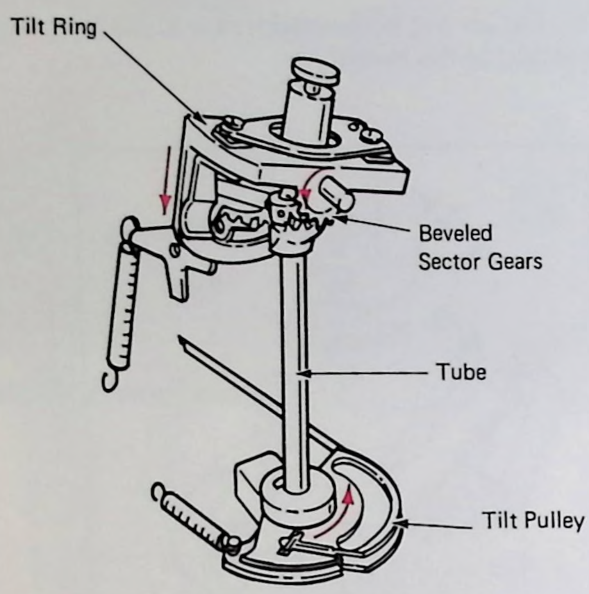


Figure 8 – Gear Tilt (Level 1)

ROTATE MECHANISM

The purpose of the rotate mechanism is to position the typehead rotationally to any of the eleven rotational positions. The rotate mechanism is similar to the tilt mechanism except more latches and levers are required. Motion is transferred through the latch assembly, balance lever, rotate bellcrank, rotate link, rotate arm, rotate tape, rotate pulley, rotate shaft and the dog bone to rotate the upper ball socket (Figure 9). The typehead is keyed to the upper ball socket and will rotate whenever the upper ball socket rotates.

ROTATE DIFFERENTIAL

Rotate selection is accomplished by four latches. Each latch supplies a different leverage for different amounts of rotation. Various combinations of these latches position the typehead to one of the eleven rotational positions. The latches have rotational incremental values assigned to them. They are from left to right. R2A, R1, R2 and negative 5. Latch R2A is never used by itself and is only used for rotational positions 4,5 and negative 1.

Rotation of up to five characters is required on either side of the typehead rest position. Latches R1, R2, and R2A provide 1,2,3,4 and 5 increments of counterclockwise or positive rotation, depending on the combination operated. Those latches not needed are pulled forward by the keyboard selector interposers (not shown). The negative 5 rotate latch rotates the typehead five units in the clockwise or negative direction. Lesser increments of negative rotation are selected by including one or more positive increments (latches) with the negative 5. The negative 5 latch, however, must be pulled forward when negative rotation is required.

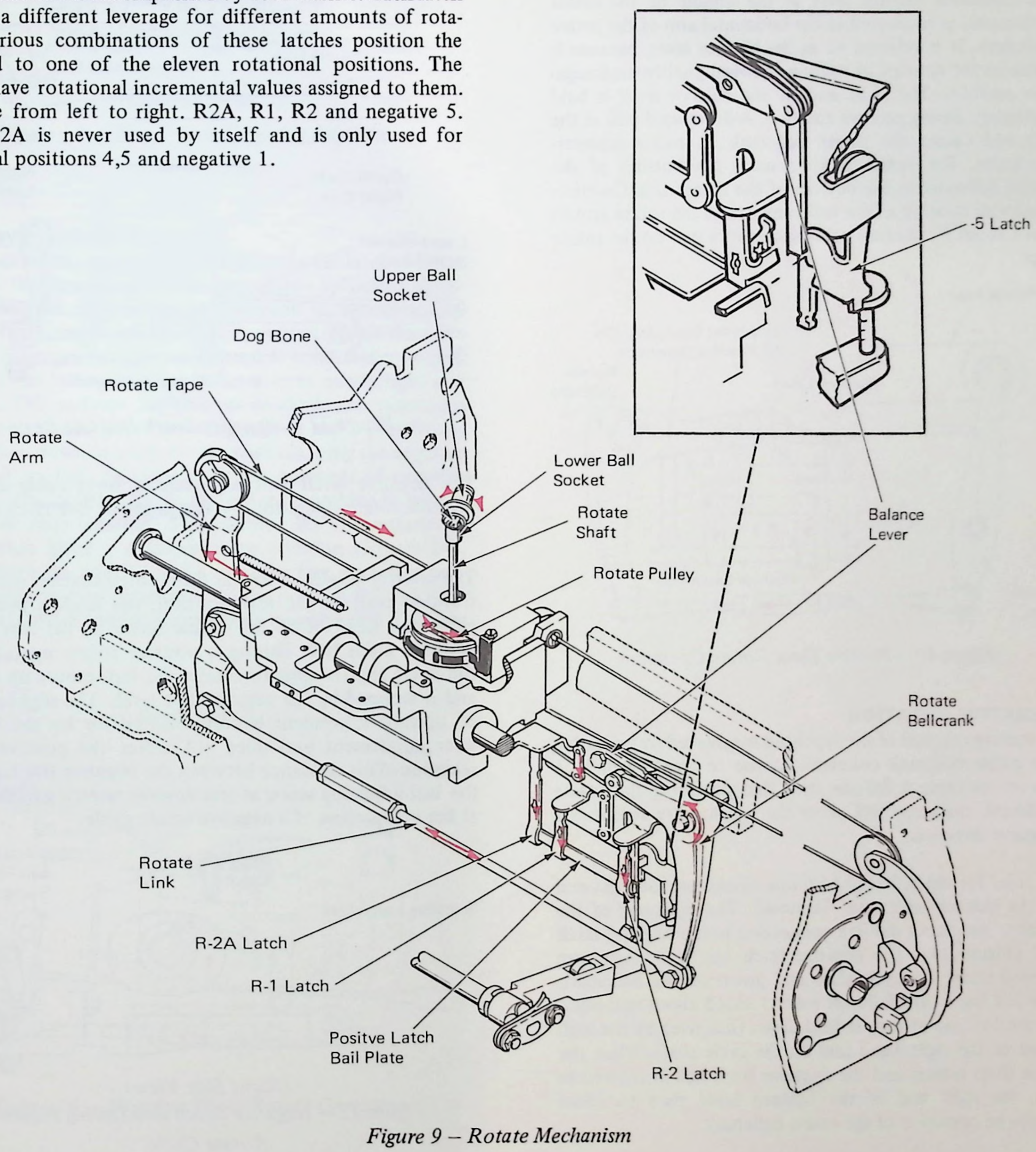


Figure 9 – Rotate Mechanism

POSITIVE ROTATION

Consider the positive rotation of the typehead first. The three selector latches involved in positive rotation are those farthest to the right under the positive latch bail. They are from left ro right. R2A, R1, and R2.

The R1 latch is used for one-character rotation and the R2 latch for two-character rotation. With the R1 and R2 latches combined, as shown in Figure 10, a positive 3 rotate character will be selected. The R2 and R2A latches are operated for a four-character rotation. A five-character rotation is obtained by pulling down the R1, R2, and R2A latches.

An adjustable balance lever at the middle of the rotate differential is connected to the horizontal arm of the rotate bellcrank. It is referred to as the balance lever, because it balances the amount of motion between positive and negative rotation. The right end of the balance lever is held stationary during positive rotation. A downward pull at the left end causes the rotate bellcrank to rotate counterclockwise. The rotate link connects the bottom of the rotate bellcrank to the bottom of the rotate arm. Counterclockwise rotation of the bellcrank causes the rotate arm to pivot about its fulcrum point and exert a pull on the rotate tape.

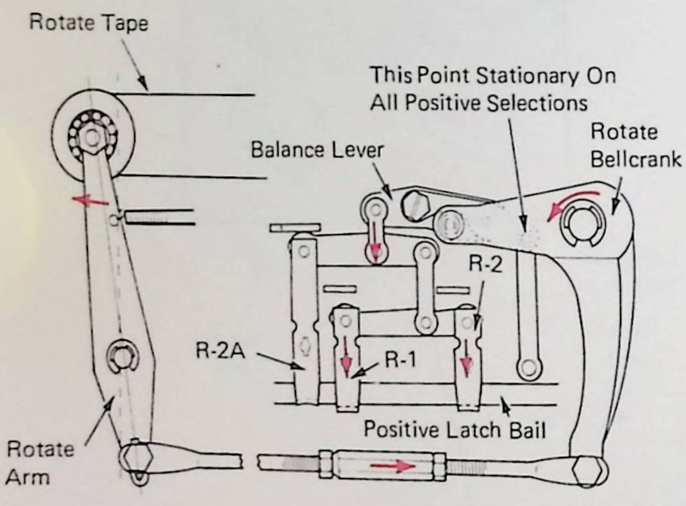


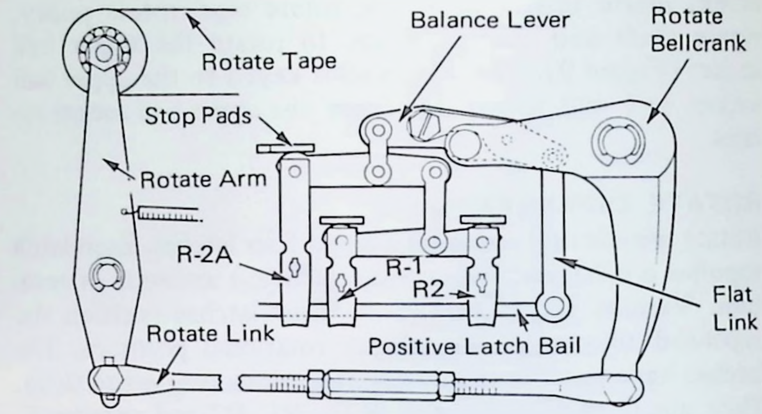
Figure 10 – Positive Three Rotate Operation

NEGATIVE ROTATION

If positive rotation of the typehead is achieved by operating the rotate bellcrank counterclockwise to create a pull on the rotate tape, it follows then that operating the rotate bellcrank clockwise will allow the typehead to rotate in a negative direction.

In order for the bellcrank to rotate clockwise, the right end of the balance lever must be raised. The right end of the balance lever has a flat link connection to the negative latch bail (Figure 11). The negative latch bail is a single arm located under the cycle shaft and pivots on the bail shaft. The bail has a cam follower roller located about mid-point on the bail and at rest, is held down (inactive) by the high point of the right hand cam on the cycle shaft. When the cycle shaft rotates and the negative latch bail is allowed to rise, the right end of the balance lever rises to allow clockwise operation of the rotate bellcrank.

The high point of the right hand cam is 90 degrees from the high point of the other two cams. This ensures that when the positive latch bail is driven DOWN to the active position, the negative latch bail can be UP in the active position.



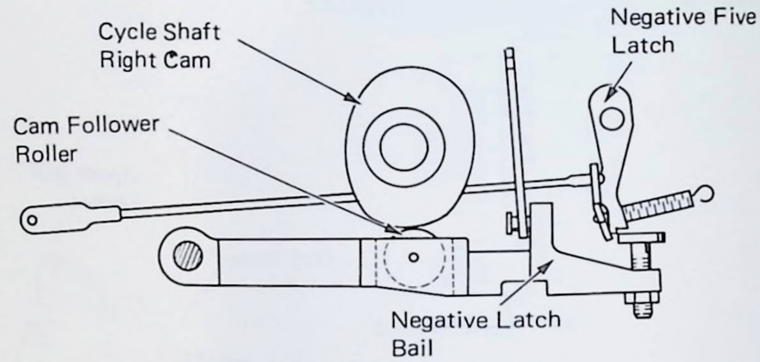
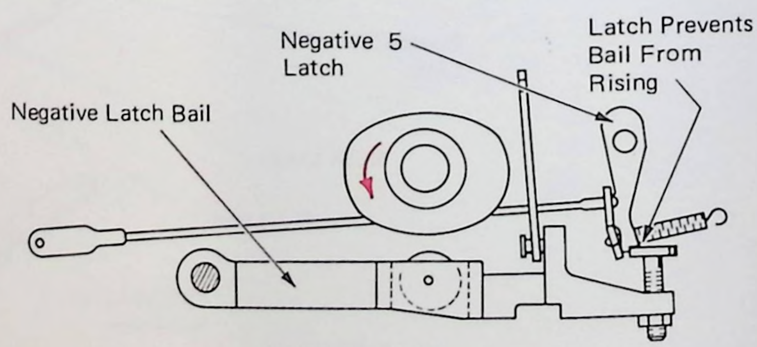


Figure 11 – Negative Latch Bail (At Rest)

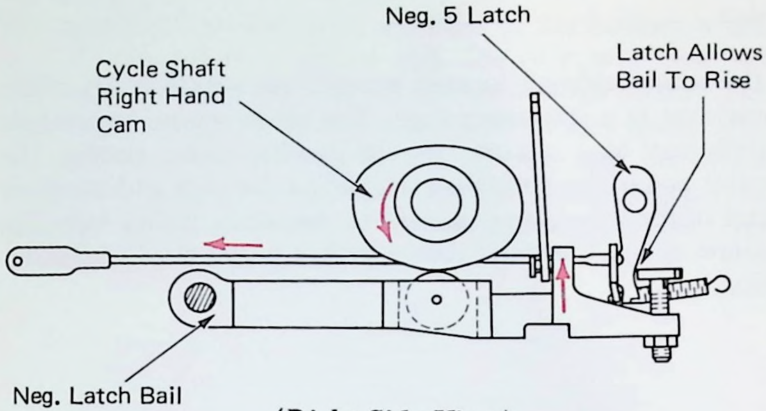
The negative latch bail is prevented from rising during a positive rotate operation by the negative five latch (Figure 12).

The latch is mounted to the differential bracket and pivots front to rear. In the rest position, the latch is positioned above the head of an adjustable screw at the rear of the negative latch bail. During a positive rotate operation, as the cycle shaft begins to rotate, the bail moves up slightly and is stopped by the negative five latch. The slight amount of upward movement is compensated for by the balance lever adjustment and does not affect the positive rotate selection. This clearance between the negative five latch and the bail adjusting screw at rest ensures resetting of the latch at the completion of a negative rotate cycle.



(Right Side View)
Figure 12 – Negative Latch Bail During Positive Rotate Cycle

When the latch is pulled forward, the bail is allowed to rise (Figure 13). The force which raises the bail is applied by the rotate pulley spring and the extension spring attached to the rotate arm.



(Right Side View)

Figure 13 – Five-Unit Bail During Negative Rotate Cycle

NEGATIVE THREE ROTATE

Movement of the negative latch bail from the latched-home point to the low point of the cam allows sufficient clockwise movement of the rotate bellcrank to permit a five-character negative rotation of the typehead. If less than five units of negative rotation is desired it is necessary to pull down on the left end of the balance lever as the right end goes up. This reduces the amount of clockwise movement of the rotate bellcrank. Operating one or more positive rotate latches down in conjunction with allowing the negative latch bail to rise, provides different amounts of negative rotation. The positive R1 and negative 5 combine to permit a negative four rotation. The positive R2 and negative 5 combination gives a negative three rotation (Figure 14). The positive R1 and R2 and a negative five operation permits a negative two rotation. And the positive R2 and R2A plus a negative 5 combination gives a negative one rotation.

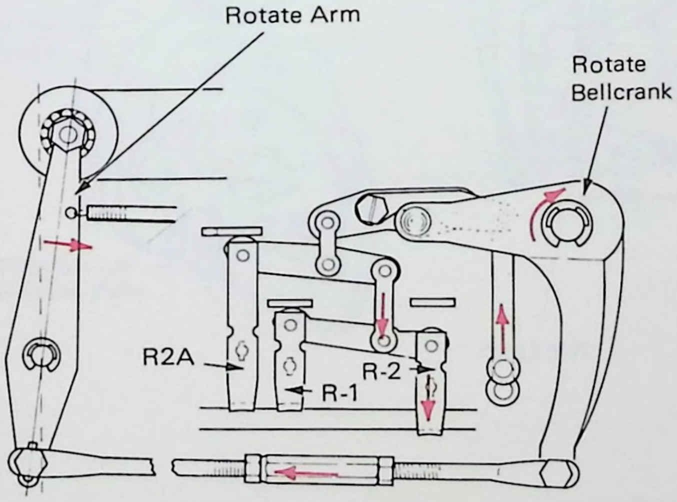


Figure 14 – Negative Three Rotate Operation

ROTATE TAPE SYSTEM

The rotate tape operation is similar to the tilt tape operation; however, the rotate tape transfers motion to rotate the typehead (Figure 15). The rotate tape is connected to the rotate pulley in the rocker, guided through the left side of the carrier, extended to the left around the rotate arm pulley, back to the right around the shift arm pulley, and connected to the right side of the carrier.

NOTE: The shift arm pulley moves only during a shift operation; therefore, consider it stationary for the present. (For more information on shift operation, refer to the Shift Section of this manual).

When the rotate arm is moved away from the printer side frame, a pull is exerted on the rotate tape to rotate the typehead in a counterclockwise direction. When the rotate arm is moved toward the side frame, the typehead is rotated in the clockwise direction by allowing the rotate tape to wind around the rotate pulley under rotate spring tension.

The rotate spring is located beneath the rotate pulley and is enclosed in a stationary cage. The rotate spring cage is held stationary by a retainer attached to the rocker casting. The outer end of the spring is attached to the cage and the inner end of the spring is connected to the rotate pulley hub. The rotate spring loads the rotate pulley in the clockwise direction.

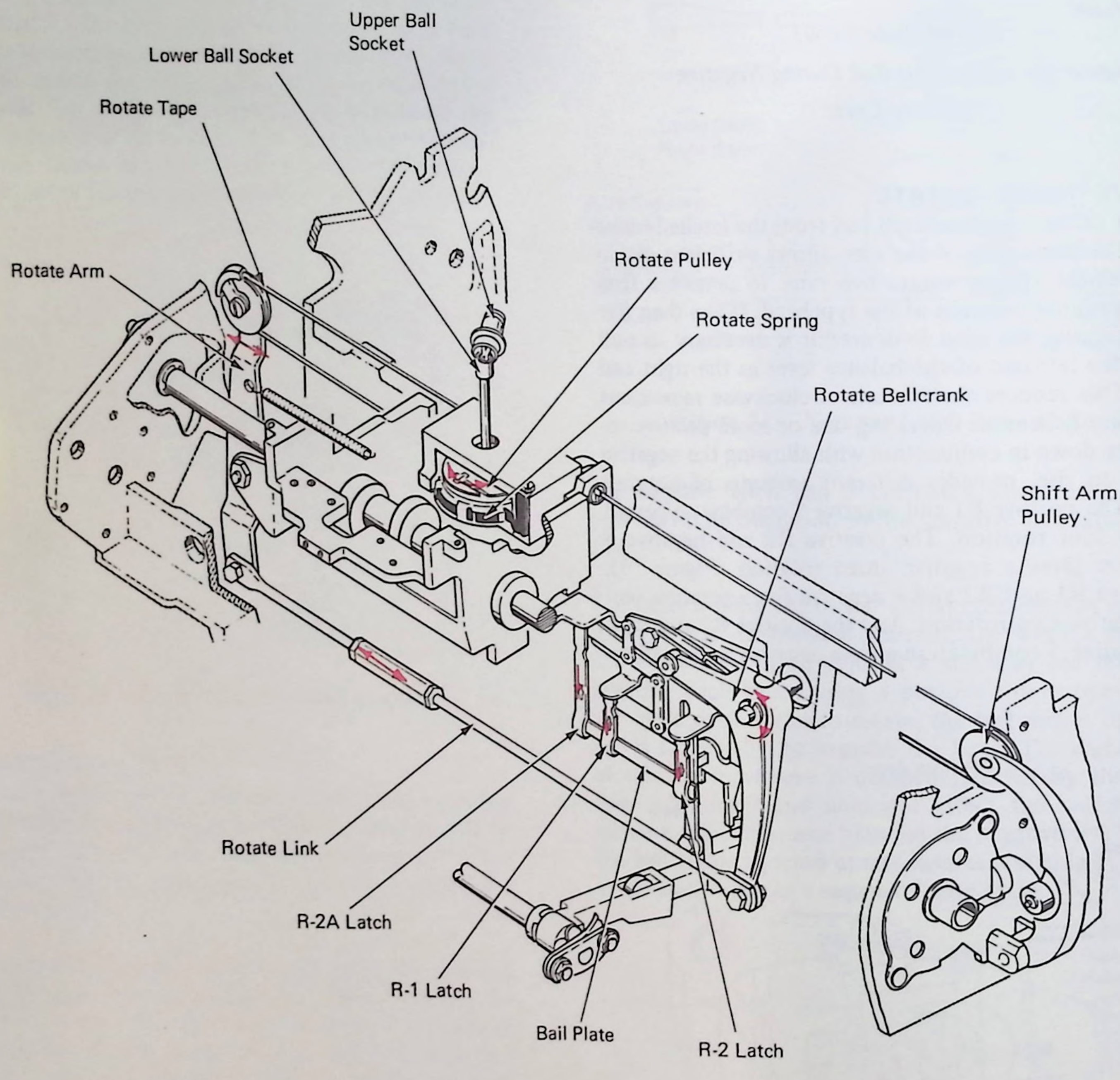


Figure 15 – Rotate Tape System

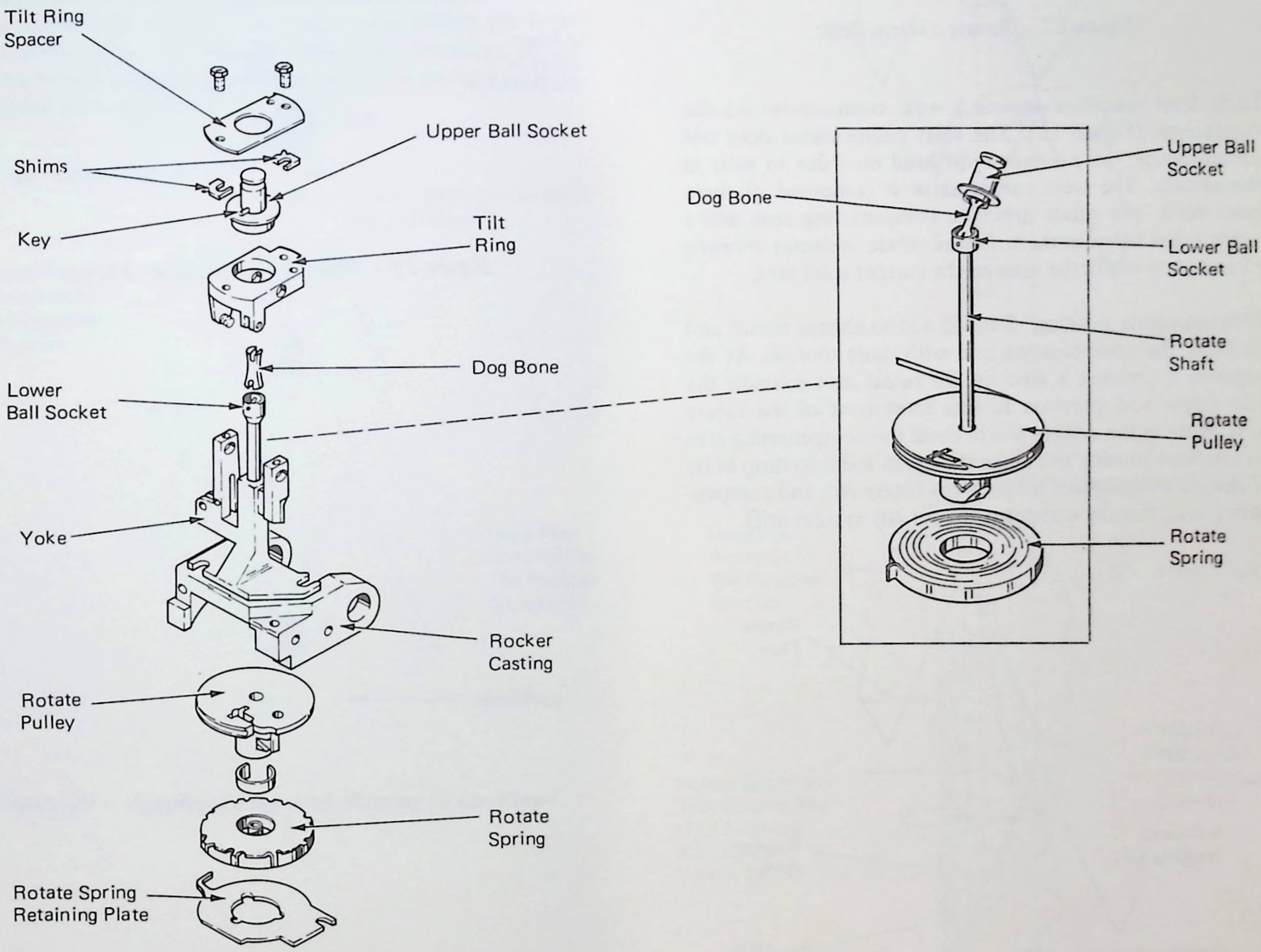
TYPEHEAD ROTATION

The typehead clips securely to the upper ball socket and rests over a key which is pressed into the upper ball socket. This arrangement ensures that the typehead will rotate whenever the upper ball socket rotates.

The upper ball socket has a shoulder at the bottom which fits into the tilt ring (Figure 16). The fit is very close yet permits free rotary motion of the upper ball socket. The upper ball socket is held in place by the tilt ring spacer. The spacer is attached directly to the tilt ring and fits over a flange of the upper ball socket. The tilt ring spacer is shimmed to allow rotation of the upper ball socket yet restricts up and down play.

The underside of the upper ball socket is hollow and forms the socket for a ball joint connection. A dog-bone shaped ball joint fits into the socket over a pin that extends through the socket. The lower end fits over a pin in the lower ball socket. The lower ball socket is part of the rotate shaft. The rotate shaft operates directly inside the center of the yoke. Attached near the bottom of the shaft are the rotate pulley and rotate spring.

These two ball socket connections act as universal joints to permit the typehead to be rotated and tilted at the same time.



16 – Typehead Rotation

Any wear in the system will cause the typehead to drift in the negative direction. This is because of the rotate spring applying a constant pressure to the rotate system in a negative direction. Because of this drift, coarse alignment and homing adjustments should be checked each time the machine is visited (Figure 17).

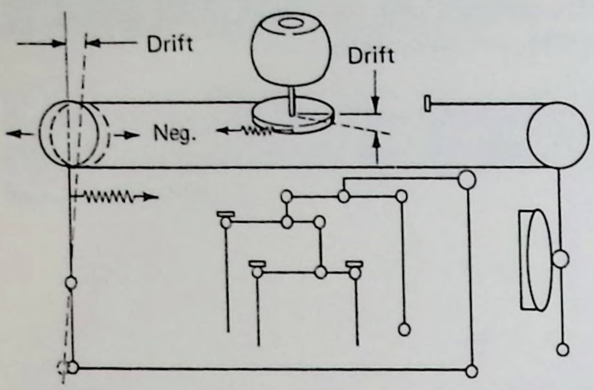


Figure 17 – Rotate System Drift

Early level machines include a wear compensator on the rotate arm (Figure 18). The wear compensator does not prevent wear, but prevents most head drift due to wear in the system. The wear compensator is composed of three basic parts: the rotate arm, the compensating arm, and a nylon roller between them. For all rotate positions between +5 and -3, it works the same as the current solid arm.

Between rotate position -3 and -5 a ratio change occurs and provides the compensating arm with more motion. At the negative 5 position a stud on the rotate arm contacts the side frame and prevents further movement of the rotate arm. Wear in the system would cause the compensating arm to continue moving and allow the nylon roller to drop in its V-shaped wedging slot between the rotate arm and compensating arm, thereby compensating for any system drift.

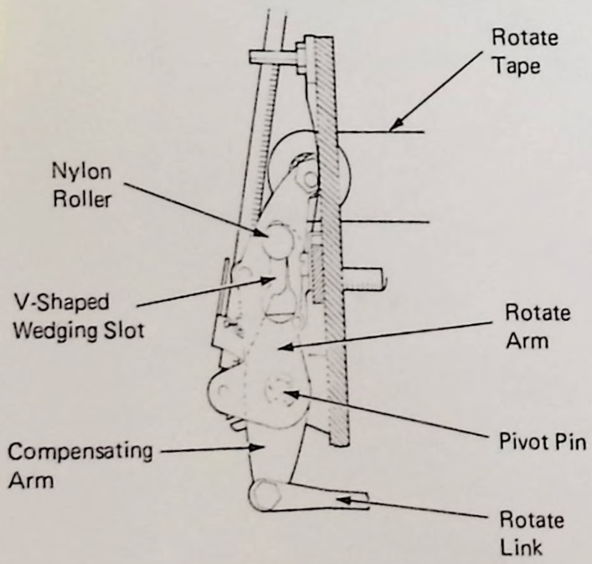


Figure 18 – Basic Components Of The Wear Compensator

Wear potential in the rotate mechanism is defined as the ability of the rotate mechanism to properly align the typehead after a measurable amount of wear is felt in the mechanism (Figure 19).

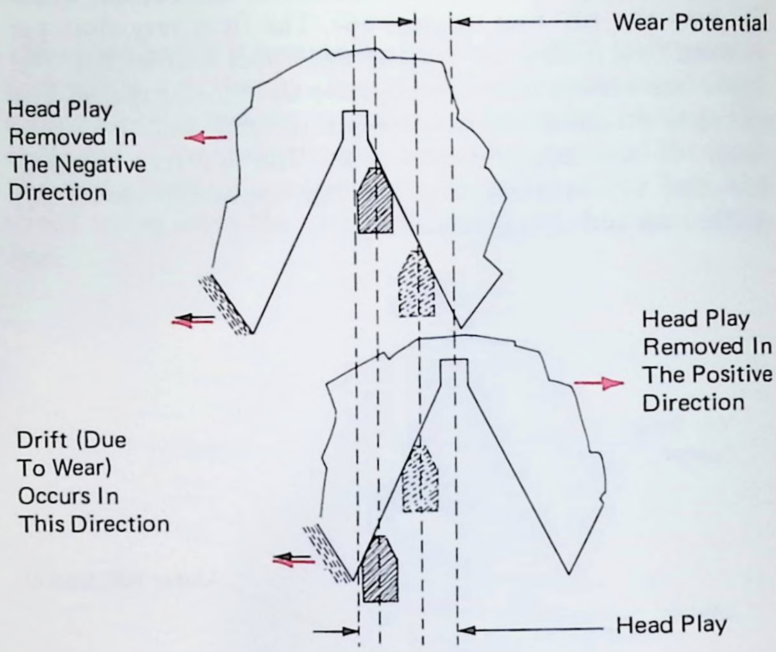


Figure 19 – Wear Potential (Rear View)

A portion of the typehead play provides the rotate system with a substatial amount of wear potential. To explain how this is accomplished let's look at the relationship between headplay, homing and bandwidth.

TYPEHEAD PLAY

Typehead play is the free motion in the typehead when the I/O is at rest. It is due to the ball joint connection between the upper ball socket and the lower ball socket. The play is .050"-.060" measured at the typehead skirt or slightly less than half the distance between teeth. The headplay is split between the positive and negative slopes of the typehead notch (Figure 20). The typehead is homed so that the rotate detent contacts the notch slope, with the head-play removed in the negative direction, approximately .015" down the negative side of the notch.

The purpose of this adjustment is to provide maximum wear potential to the system. Also, this adjustment tends to allow more time to withdraw the detent before the typehead restores in the positive direction. Breakage in the system would occur if the detent did not withdraw prior to typehead movement.

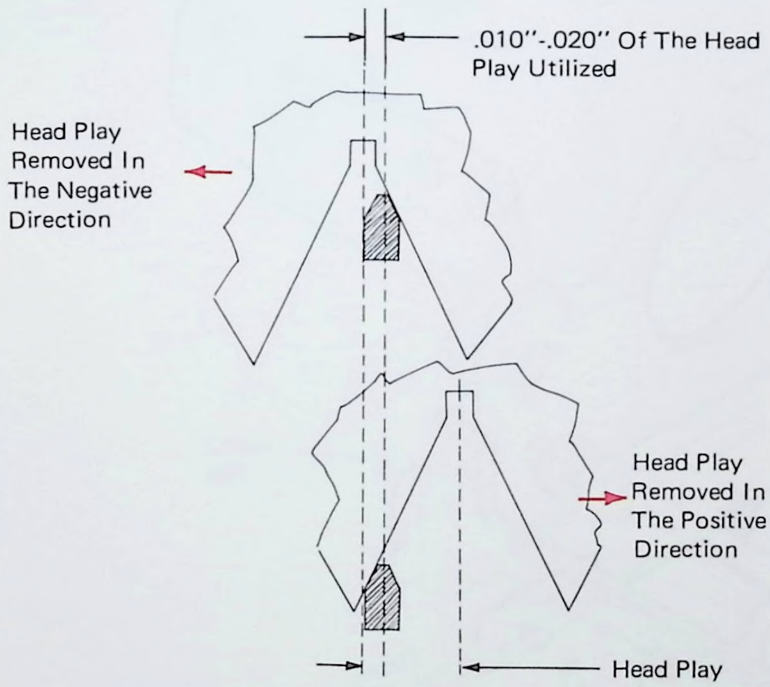


Figure 20 – Typehead Play And Homing (Rear View)

BANDWIDTH

Next, lets consider bandwidth. With the headplay removed in the negative direction, the greatest variation between detenting of one typehead position (Figure 21A) and another typehead position (Figure 21B) is called bandwidth. It is caused by unequal adjustment of the rotate latch stop pads. You will note that we have now used up almost 3/4 of the negative slope of the typehead notch.

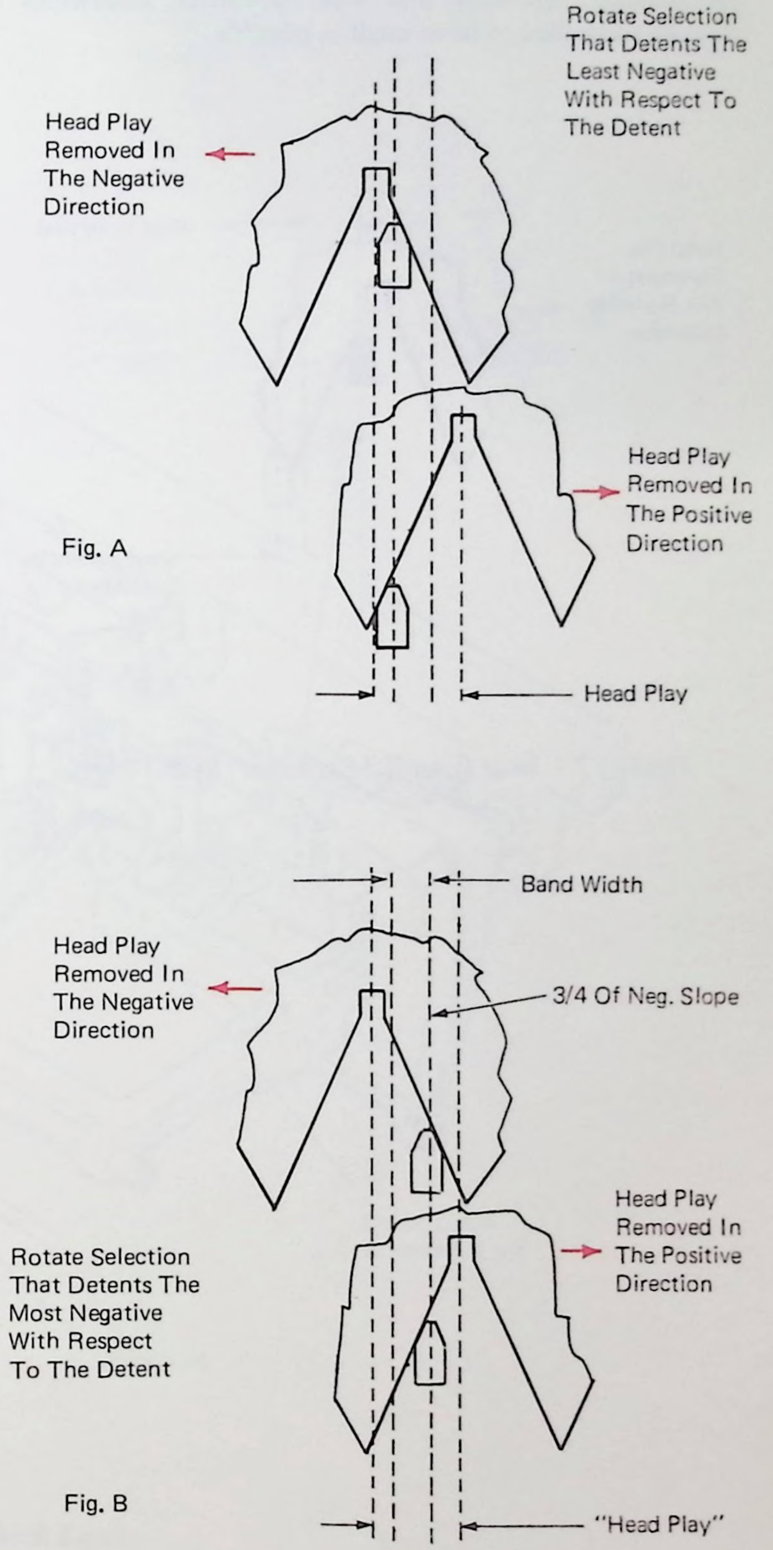


FIgure 21 – Bandwidth (Rear View)

When wear occurs in the system, the typehead drifts in the negative direction with respect to the detent. This causes the headplay and bandwidth to drift in the negative direction with respect to the detent. As long as this drift does not exceed the wear potential portion of headplay, the detent will continue to fine align the typehead. Once the wear potential is exceeded, the rotate selection that coarse aligns the most negative, with respect to the detent, will fail to align the detent notch. The detent will then fail to seat causing that character to print out of alignment (Figure 22). From the preceding, one can see that for optimum performance, reliability and wear potential, bandwidth must be controlled to be as small as possible.

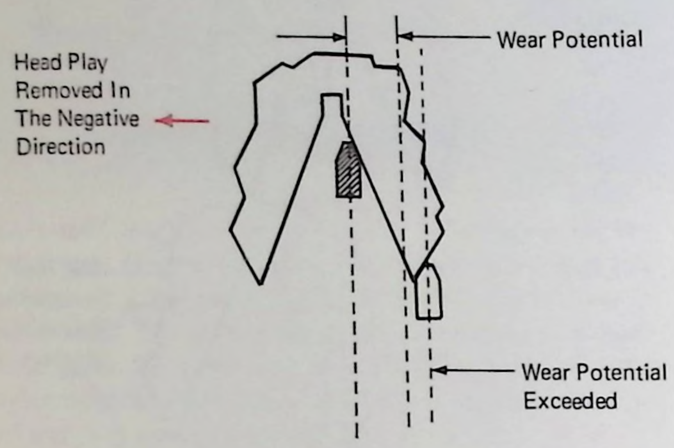


Figure 22 – Wear Potential Exceeded (Rear View)

PARITY CHECK

"Parity Check" is a system that an interface uses to determine if a valid character was sensed during a selection cycle of the I/O. The interface should check every operation for an odd number of selection contacts transferred.

Since both an even and an odd number of latches are used to operate the tilt and rotate mechanism the check latch is operated when needed, to maintain an odd condition (Figure 23). It's only mechanical function is to operate a selection contact.

The check latch is left under the bail and operated whenever the character being typed is selected by an even number of tilt and rotate latches. The use of this latch will result in all character selections having an odd number of latches pulled down by the latch bail. When the number of latches operated is already odd, the check latch is not needed for parity checking, and is removed from under the bail. Parity Check is discussed further in the Electrical section.

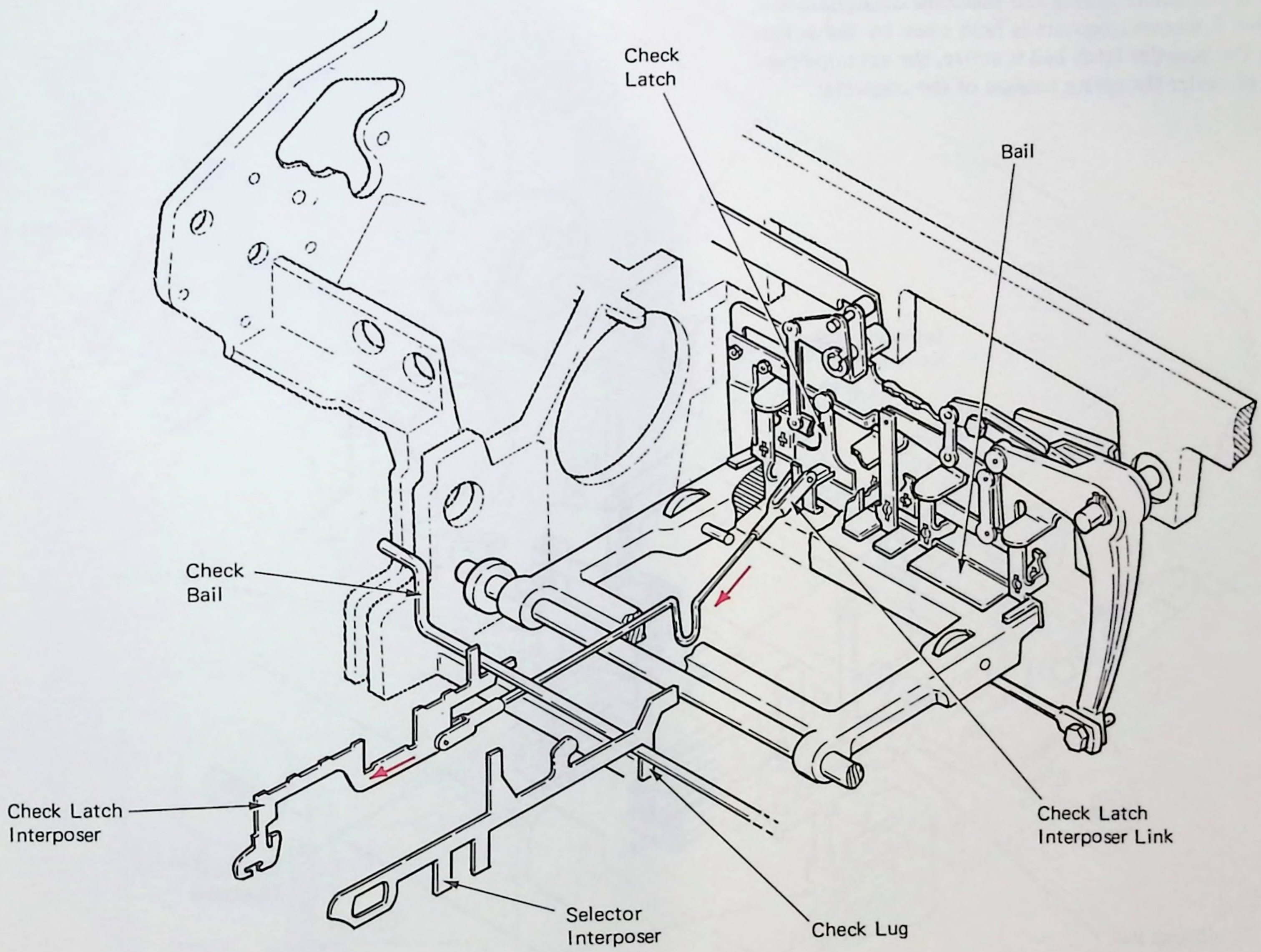


Figure 23 – Check Latch

SELECTION TRANSMIT CONTACTS

The selection transmit contact assembly is mounted on a plate which is attached to the power frame directly below the selector latches. The assembly consists of seven sets of contacts, actuators, and their mounting hardware. The purpose of these contacts is to indicate to the electronic device which characters are being typed.

The contacts are operated by contact actuators whenever a selector latch is pulled down by the latch bail (Figure 24). An extension, to the rear of each selector latch, contacts the actuator and pushes it down whenever a selector latch is pulled down by the latch bail. The selector latch extensions operate the actuators for the T2, Check, T1, R2A, R1, and R2 selection transmit contacts.

The negative 5 selection transmit contact is directly beneath and operated by the negative 5 latch bail. If the negative latch bail is not active during the selection of a character, the negative 5 transmit contact is held open by the actuator. When the negative latch bail is active, the actuator rises with the bail under the spring tension of the contacts.

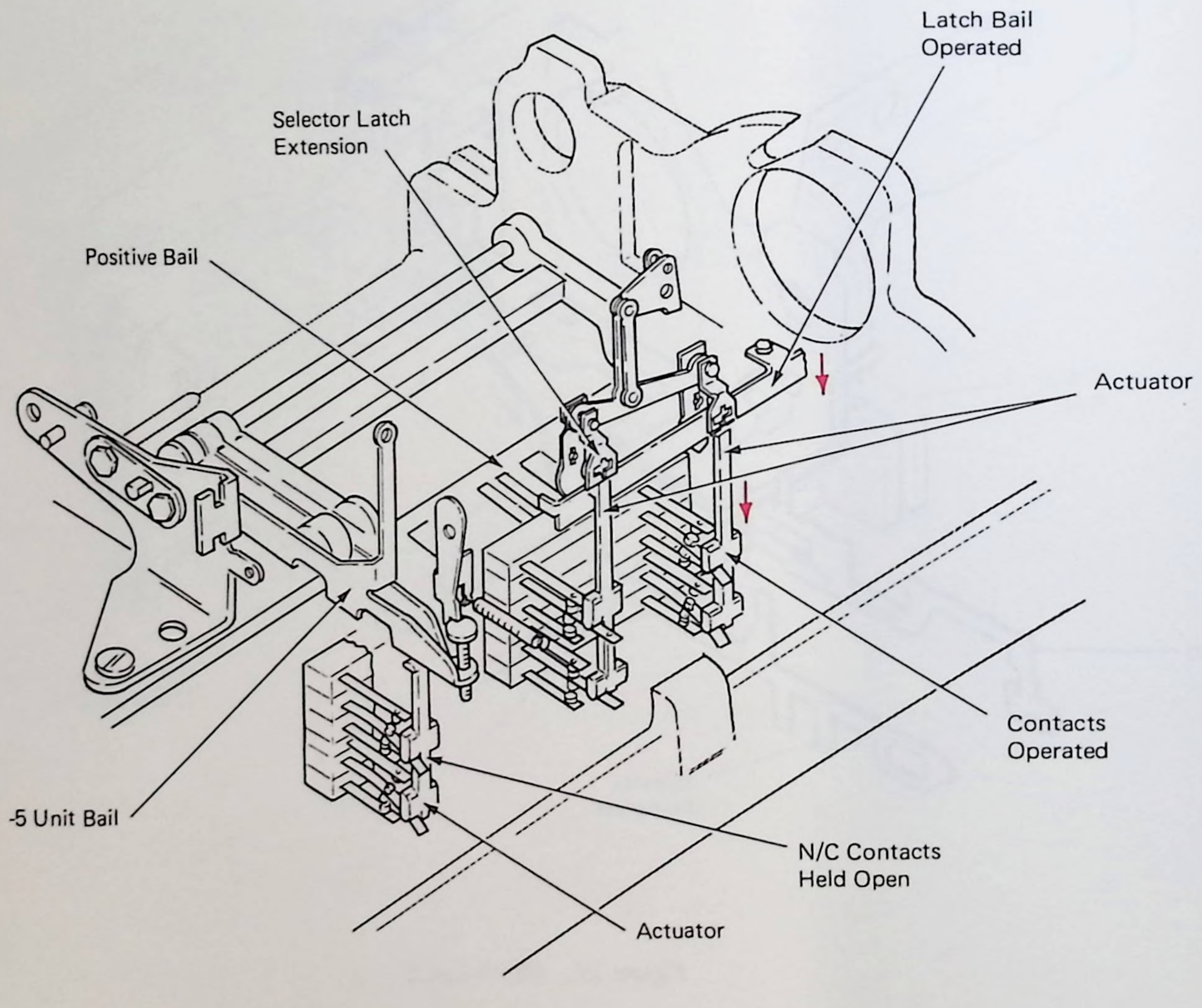


Figure 24 – Selection Contacts (Rear View)

C1 CONTACTS

A contact assembly, called C1, is located on the left side of the I/O (Figure 25) The contact is operated by a double lobe cam mounted on the cycle shaft. The contact and cam are aligned and set to make and break the contacts at a specific time during the print cycle.

The purpose of C1 is to provide a gating time for the selection contacts. In other words the selection transmit contacts should not be sampled until the N/O point of C1 has been contacted by the O/S. This happens at 85° of the print cycle and ensures all the selection contacts have had time to transfer.

Additional information concerning contact operation can be found in the Electrical section of this manual.

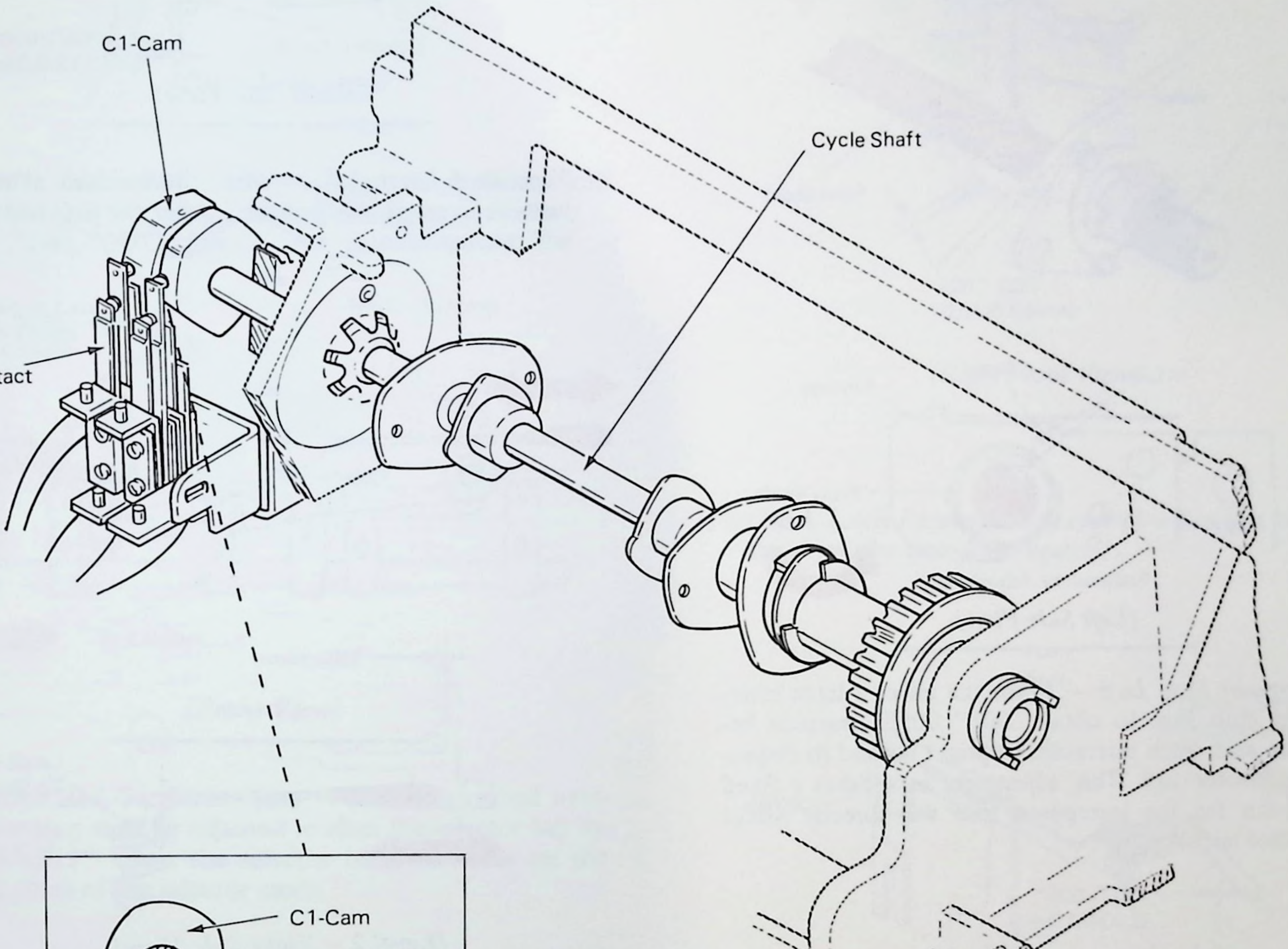
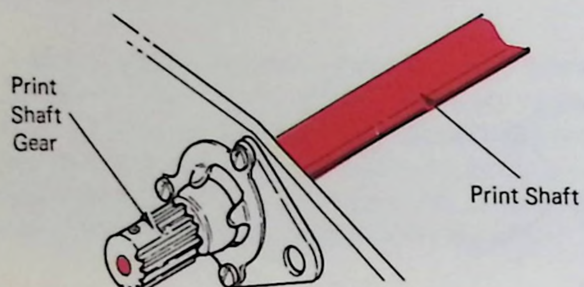
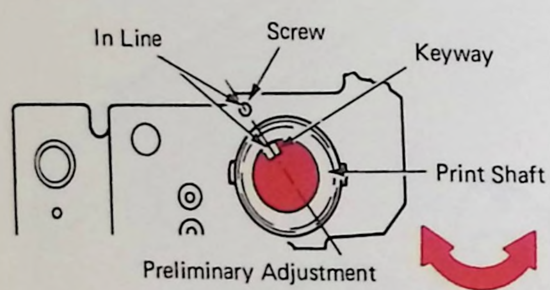


Figure 25 – C1 Contacts

NOTE: SHIFT ADJUSTMENTS MUST BE CORRECT BEFORE ATTEMPTING TO MAKE COARSE ALIGNMENT ADJUSTMENTS. REMOVE THE TYPEHEAD BEFORE BEGINNING ADJUSTMENTS.

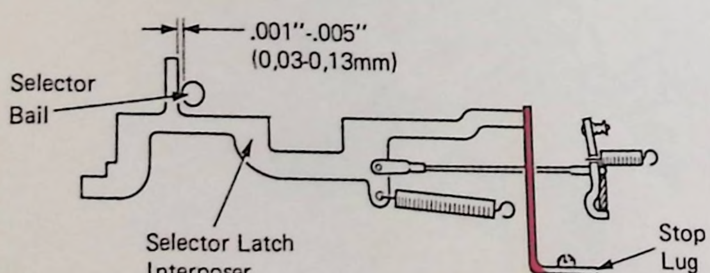
1. *Preliminary Timing* – Loosen the print shaft gear and rotate the print shaft so that its keyway is in line with the screw on the left side of the carrier casting. This coarse adjustment assures that the detents will operate at approximately the right time in the cycle.

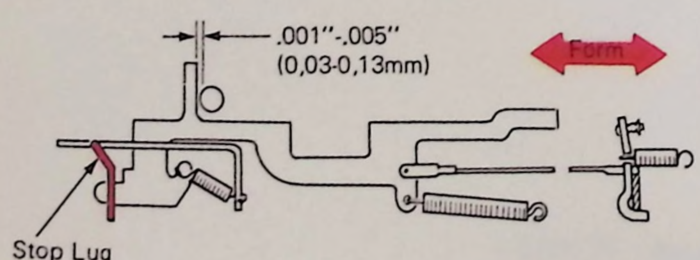




(Left Side View)

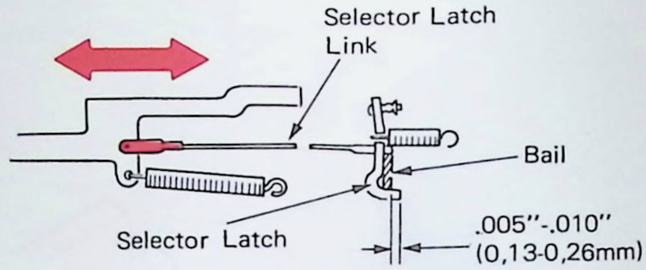
2. *Interposer Stop Lugs* – Form the selector latch interposer stop lugs to obtain .001"-.005" clearance between each latch interposer's upright lug and its respective selector bail. This adjustment establishes a fixed position for the interposers and will directly affect selector latch timing.





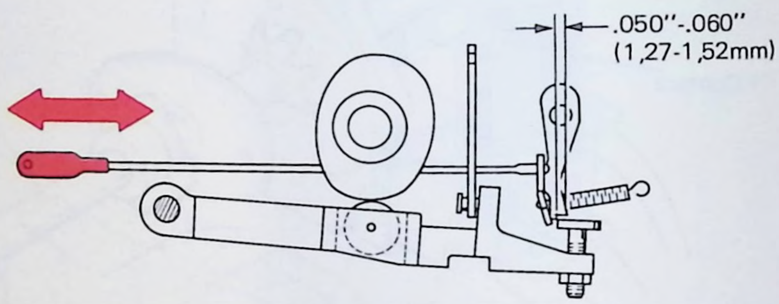
(Level 2 – Right Side View)

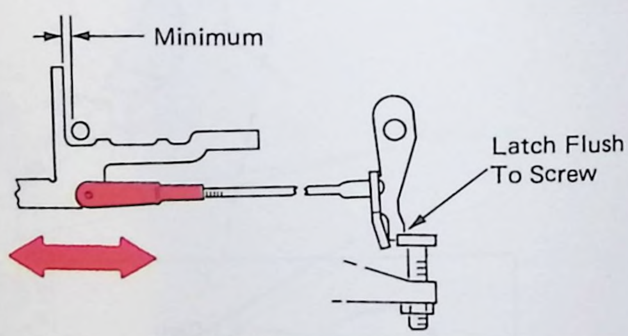
3. *Selector Latch Links* – With the machine at rest, adjust the selector latch links so that the tips of the latches overlap the bail with .005"-.010" overhang. More or less overhang can cause the latches to "pop" out from under the bail causing malselection.



(Right Side View)

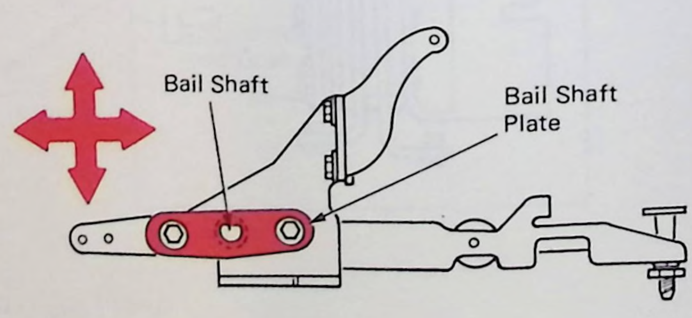
4. *Negative 5 Latch Link* – With the machine at rest, adjust the negative 5 latch link so that the negative 5 latch will overlap the stop screw head by .050"-.060".





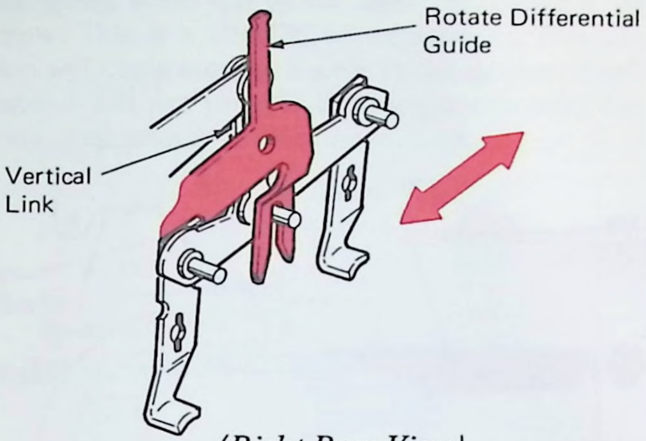
(Level 2 – Right Side View)

5. *Latch bail Shaft* – Adjust the bail shaft plate so that the bail shaft is parallel to the cycle shaft.



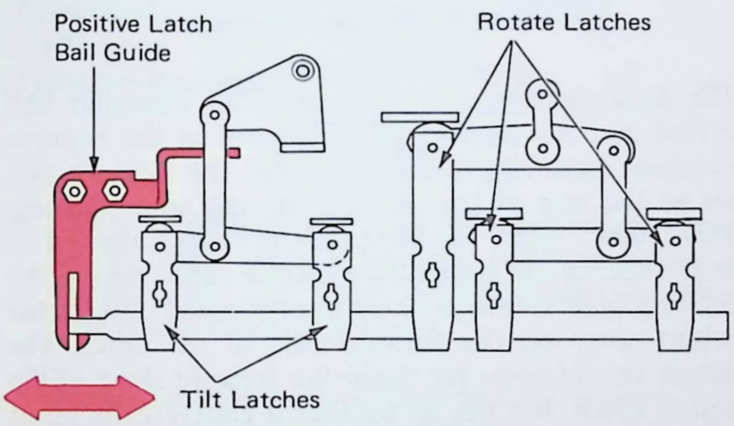
(Right Side View)

6. *Rotate Differential Guide* – Adjust the guide left and right so that the vertical link hangs vertically.



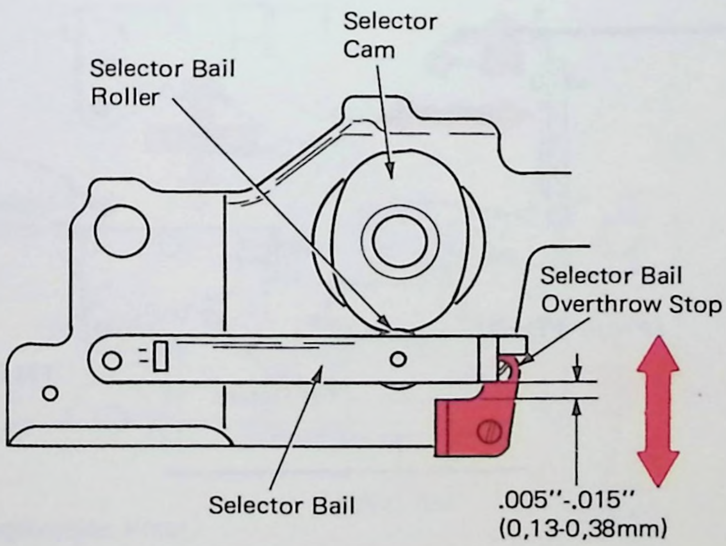
(Right Rear View)

7. *Positive Latch Bail Guide* – Adjust the guide left and right so that the tilt & rotate latches hang vertically.



(Front View)

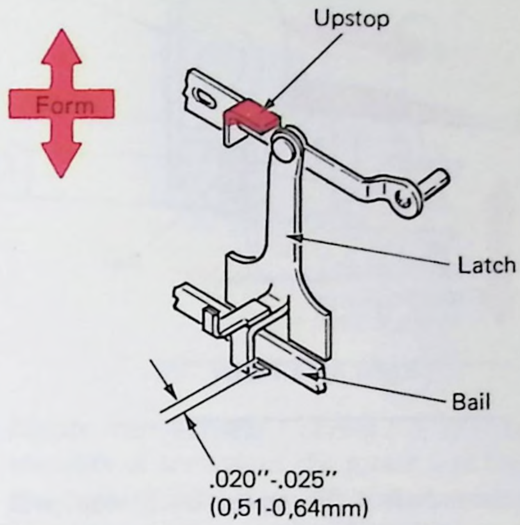
8. *Selector Bail Overthrow Stop* – The selector bail overthrow stop shall be adjusted to clear the selector bail by .005"-.015" when the selector bail rollers are on the high point of the selector cams.



(Right Side View)

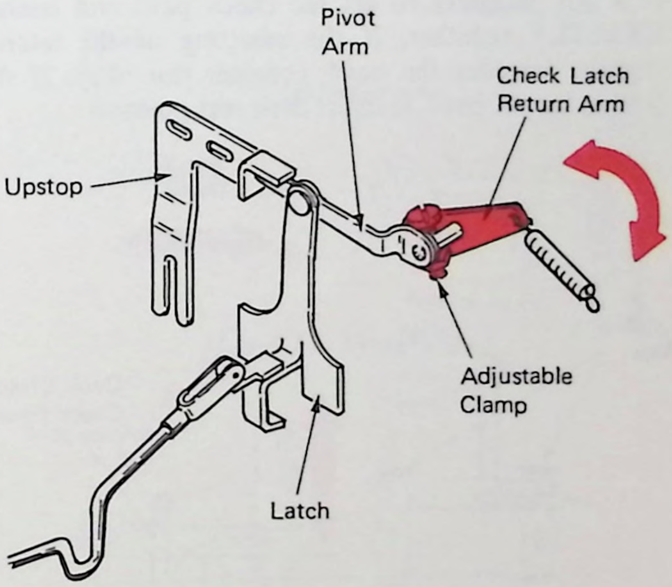
9. *Check Latch Up-Stop* – With the selector cams at the low point, form the upstop so that the latch clears the bail by .020"-.025".

Insufficient clearance may cause the check latch to fail to reset under the bail plate.



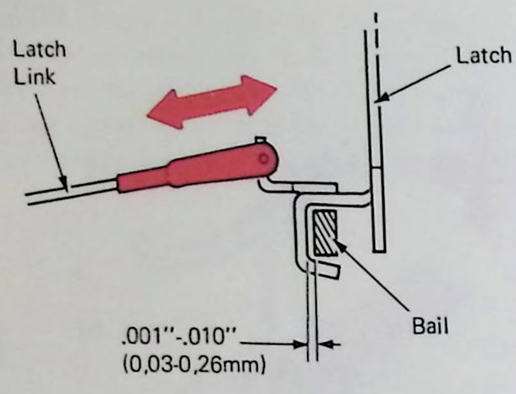
(Right Front View)

10. *Check Latch Return Arm (Level 1)* – Position to hold the pivot arm against the upstop.



(Level 1 – Right Front View)

11. *Check Latch Link* – With the machine at rest adjust the check latch link so that the check latch clears the bail by .001"-.010".

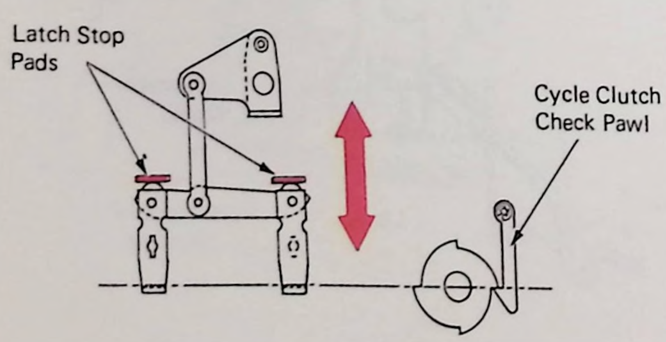


(Right Side View)

12. *Tilt Latch Stop Pads* – Form the latch stop pads by tapping them with a hammer and screwdriver. The latches should reset under the bail at the same time the cycle clutch check pawl resets.

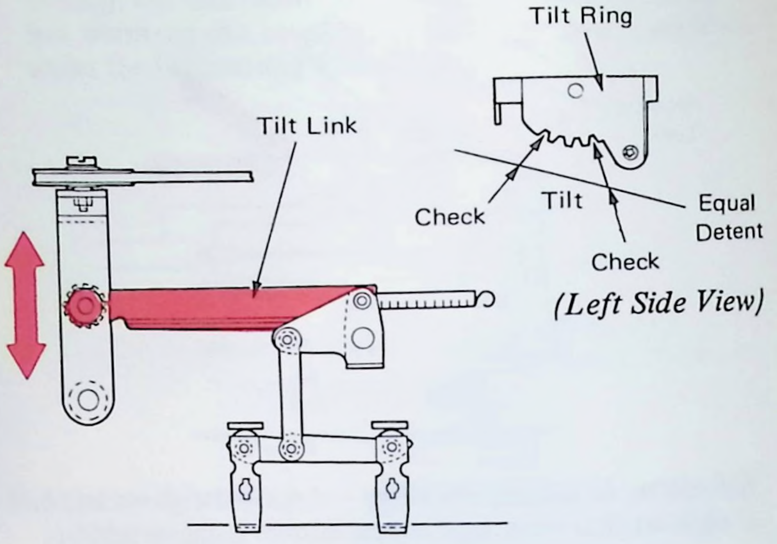
When adjusting the stop pads, it is helpful to place a finger on the pawl while observing the latches resetting. This allows you to observe exactly when the latches reset and at the same time feel when the check pawl drops in.

It is not necessary to get the check pawl and latches EXACTLY together. If the resetting of the latches slightly precedes the pawl, consider this okay. If the latches lag the pawl, readjust their rest position.



(Front View) *(Right Side View)*

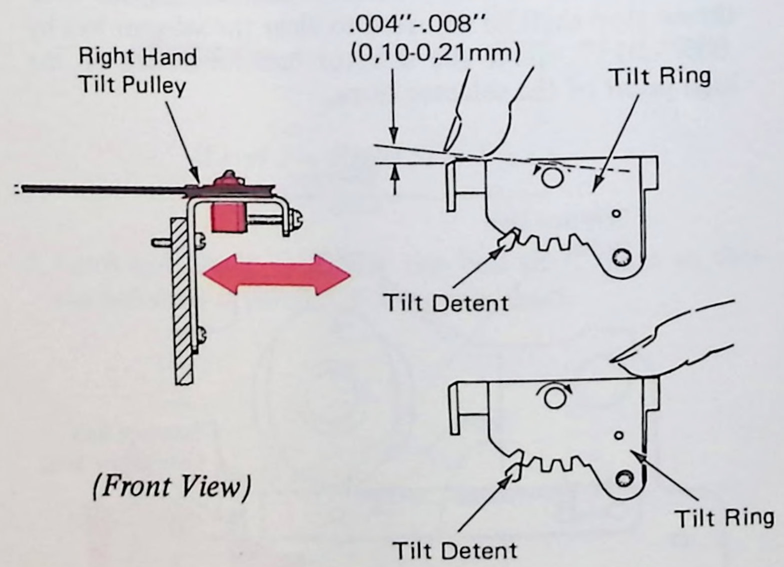
13. *Tilt Arm Motion* – Adjust the link up or down on the tilt arm so that the tilt ring will coarse align the same for a zero tilt character and a three tilt character.



(Left Side View)

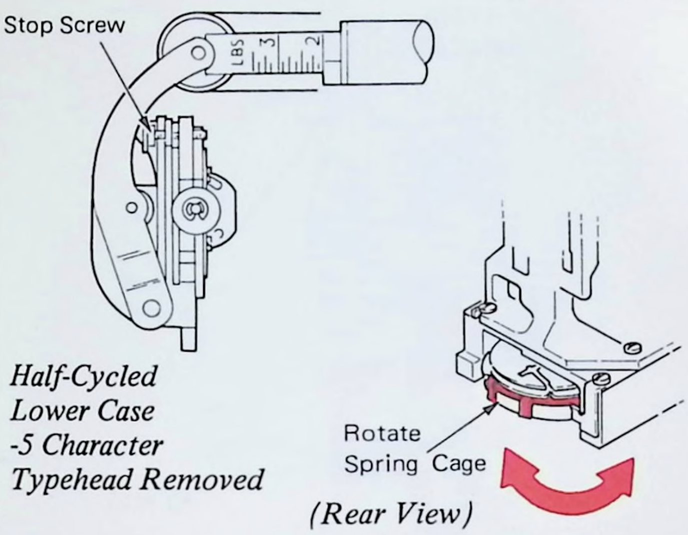
(Front View)

14. *Tilt Ring Homing* – With a zero tilt character half cycled and the tilt ring play removed in the negative direction (restoring direction), adjust the right tilt pulley so the rear of the tilt ring will rise approximately .004"-.008" when the detent is manually allowed to seat in the detent notch. As a further check remove the tilt ring play in the positive direction and observe the detent entry on the forward side of the notch. The detent should enter far down the forward slope of the detent notch, but not so far that it contacts the tip of the tooth. By homing the tilt ring off center, favoring the positive side of the detent notch, a maximum amount of wear potential is achieved.



(Front View)

15. *Rotate Spring Tension* – Shift the machine into lower case and half-cycle a -5 character. Adjust the rotate spring cage until a 1 7/8 - 2 lb. reading is obtained on the spring scale just as the shift arm contacts the stop screw. This is a CRITICAL adjustment. Excessive tension will cause increased wear in the system; insufficient tension will not provide the torque necessary for rapid lower case negative rotate operations.

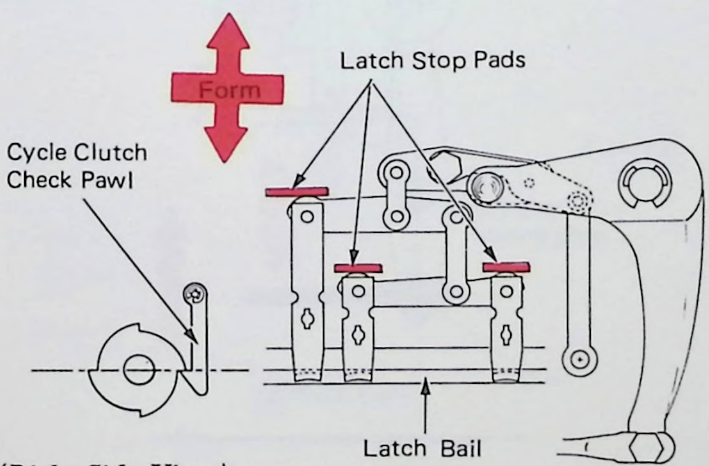


(Rear View)

16. *Rotate Latch Stop Pads* – Form the latch stop pads by tapping them with a hammer and screwdriver. The latches should reset under the bail at the same time the cycle clutch check pawl resets.

When adjusting the stop pads and the negative 5 latch stop screw (adjustment 17), it is helpful to place a finger on the pawl while observing the latches resetting. This allows you to observe exactly when the latches reset and at the same time feel when the check pawl drops in.

It is not necessary to get the check pawl and latches EXACTLY together. If the resetting of the latches slightly precedes the pawl, consider this okay. If the latches lag the pawl, readjust their rest position.

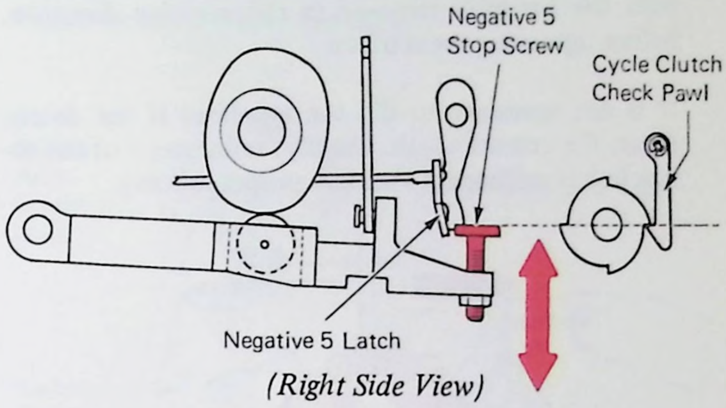


(Right Side View)

(Front View)

17. *Negative 5 Bail Stop Screw* – Adjust the negative 5 stop screw so that the negative five latch resets at the same time that the cycle clutch check pawl resets when a negative 5 character is slowly hand-cycled.

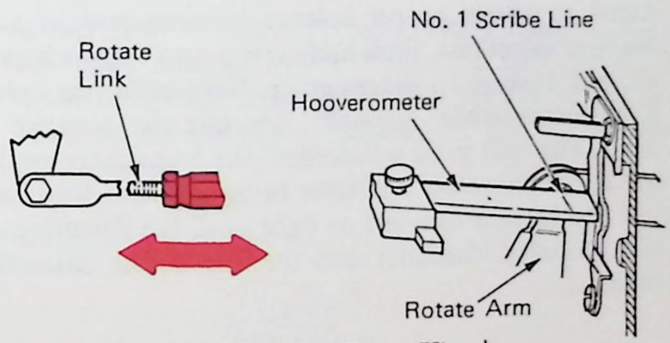
NOTE: Unless adjustments 16 and 17 are correct excessive bandwidth will result.



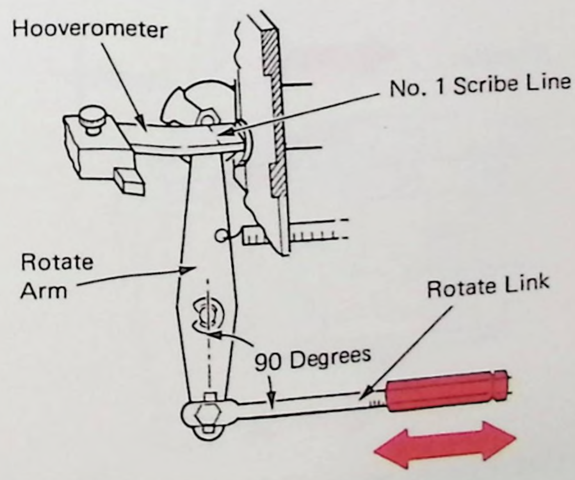
(Right Side View)

18. *Rotate Arm Vertical – (Level 1 & 2)* – To ensure equal amounts of motion of the rotate arm for both negative and positive characters, the rotate arm must be vertical. This is a preliminary adjustment, and is made by adjusting the turnbuckle on the rotate link. Adjust the link so that the center of the top of the rotate arm is in line with the No. 1 scribe line of the Hooverometer when the Hooverometer is against the sideframe.

NOTE: THE REMAINING ADJUSTMENTS MUST BE MADE WITH THE MACHINE IN UPPER CASE. REINSTALL THE TYPEHEAD.



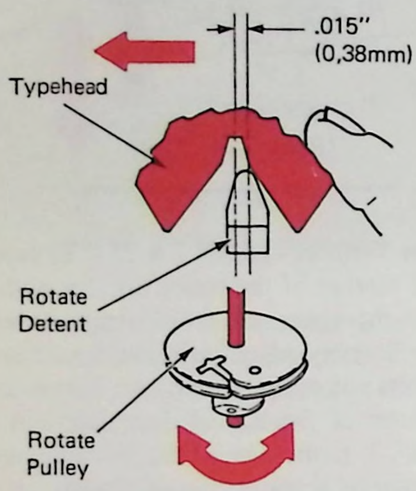
(Level 1 – Front View)



(Level 2 – Front View)

19. *Typehead Coarse Homing (Upper Case)* – Half-cycle an upper case zero rotate, tilt 1 character and check to ensure that the detent enters the proper tooth. If it does not, loosen the rotate pulley setscrew and slip the typehead around until the detent enters the correct tooth. Set the detenting in this tooth to approximately .015" down the negative slope of the typehead notch, with the headplay removed in the negative direction, before tightening the setscrew.

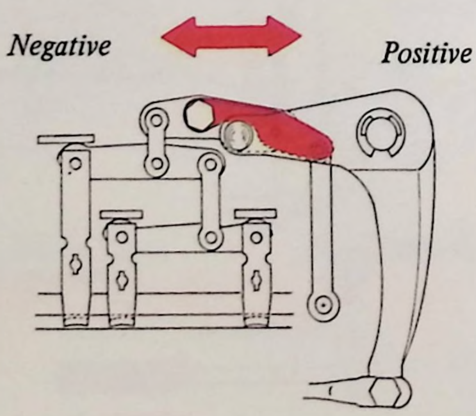
   It is not necessary to slip the typehead if the detent enters the correct tooth. Usually, refinement of the rotate link is sufficient to achieve proper homing.



Upper Case
(Rear View)

20. *Balance Lever (Upper Case)* – The balance arm is adjusted to obtain proper balance between positive and negative selections. First half-cycle a zero rotate character, and observe its detent entry. Next half-cycle a plus 5 character while manually selecting the negative 5 latch. This will yield a cancelled plus 5 character resulting in a zero rotate character being selected. Now, adjust the balance arm left or right until the detenting of the cancelled character and the zero rotate character match.

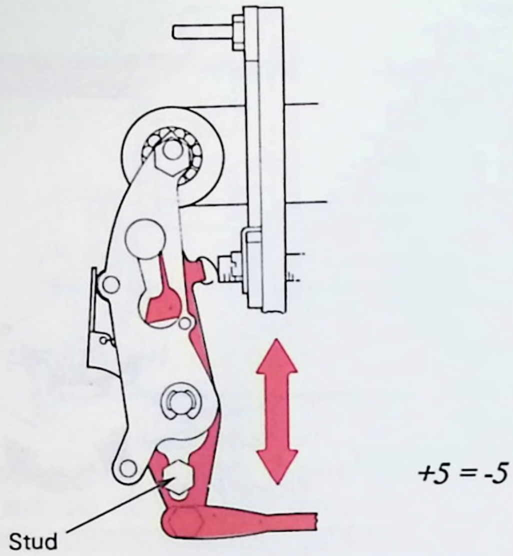
Rotate 0 Detent = +5/-5 Detent



(Front View)

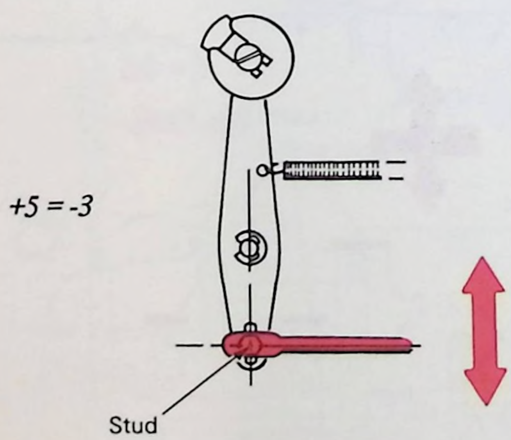
21. *Rotate Arm Motion (Upper Case)* – To provide the proper motion in each direction of typehead rotation, the stud at the bottom of the rotate arm must be vertically positioned in its slot.

   LEVEL 1 – The correct position of the stud is determined by alternately observing the detenting of the +5 and -3 characters while changing the stud's position. When the detenting is equal, the stud is correctly positioned.



(Front View)

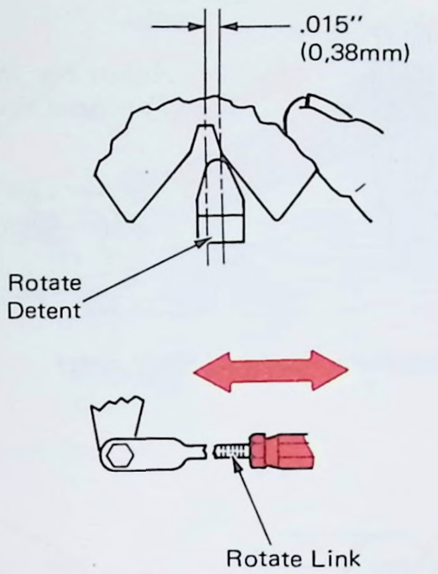
   LEVEL 2 – The correct position of the stud is determined by alternately observing the detenting of the +5 and -5 characters while changing the stud's position. When the detenting is equal, the stud is correctly positioned.



(Level 2 – Front View)

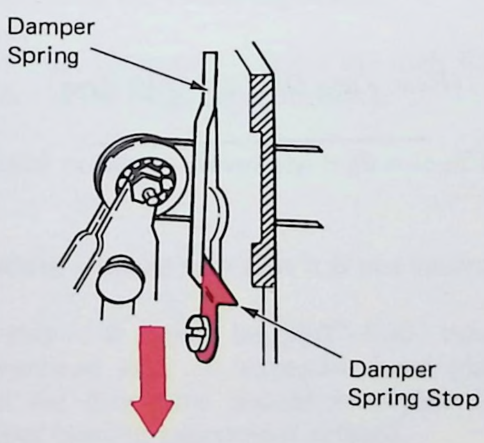
22. *Typehead Fine Homing – (Level 2 Only) (Upper Case)* – Adjust the rotate link so the rotate detent contacts the negative slope of the typehead .015" from the center of the notch when the home character is half-cycled. This adjustment allows the greatest amount of wear potential available before a failure can occur.

REMEMBER, on machines using the solid rotate arm, homing should be checked on EVERY call.



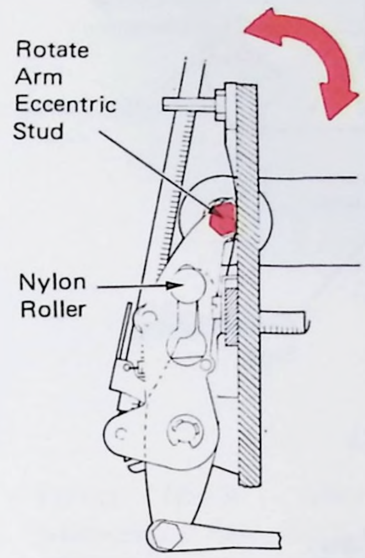
(Rear View)

23. *Damper Spring Stop – (Level 1 Only) (Upper Case)* – Move the damper spring stop to the bottom of the damper spring. This is a preliminary adjustment to prevent the damper spring from interfering with the following adjustments.

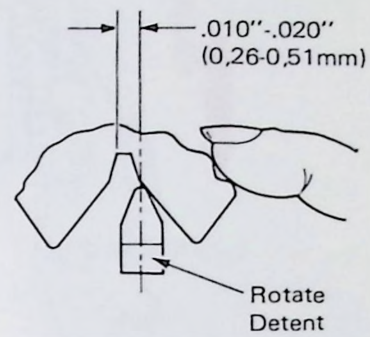


(Front View)

24. *Rotate Arm Eccentric Stud – (Level 1 Only) (Upper Case)* – Half cycle -5 character and raise the nylon roller in its slot to ensure it is not restricting the rotate arm. Adjust the eccentric stud rotationally so the rotate detent contacts the negative slope of the typehead .010"-.020" from the center of the notch. This adjustment allows the greatest amount of wear potential available before a failure can occur.

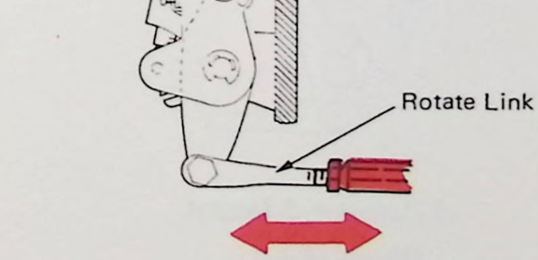


(Rear View)



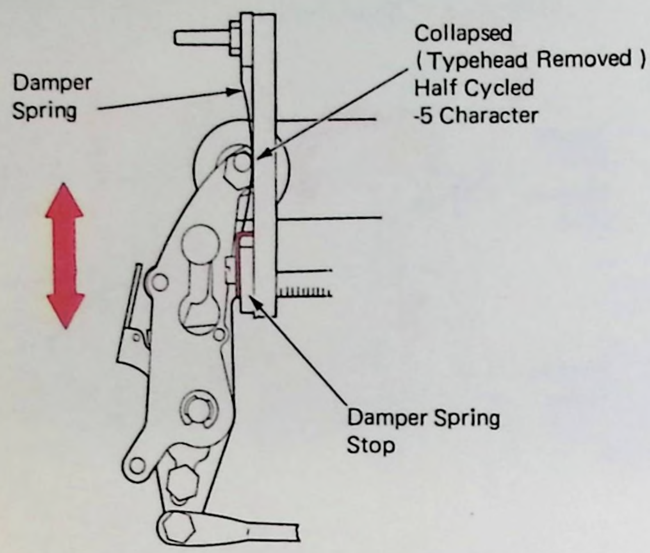
(Rear View)

25. *Rotate Link – (Level 1 Only) (Upper Case)* – Adjust the rotate link so, with a -5 character half cycled, the nylon roller will drop .060" from the top of the slot. This permits maximum adjustment life of the wear compensator.



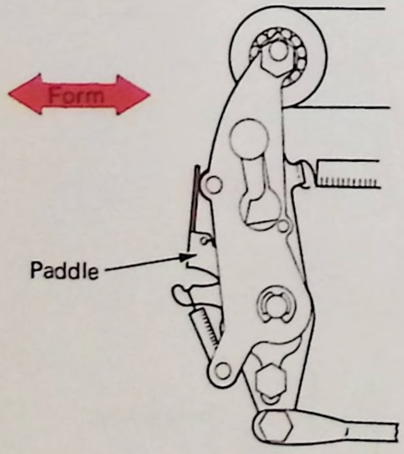
(Front View -5 Character Half-Cycled)

26. *Damper Spring Stop (Level 1 Only) (Upper Case)* – Adjust the damper spring stop vertically so the damper spring will just collapse against the power frame with a -5 character half-cycled and the typehead removed.



(Front View)

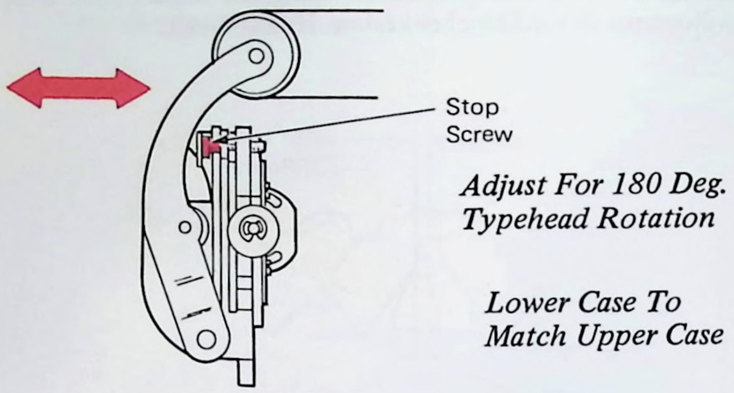
27. *Ratio Change – (Level 1 Only) (Upper Case)* – Form the paddle on the wear compensator assembly so the -3 character detents the same as the -5 character. Each time the paddle is formed, the machine must be re-cycled (raise the roller and cycle a -5 character) to allow the mechanism parts to seat properly before the adjustment is checked.



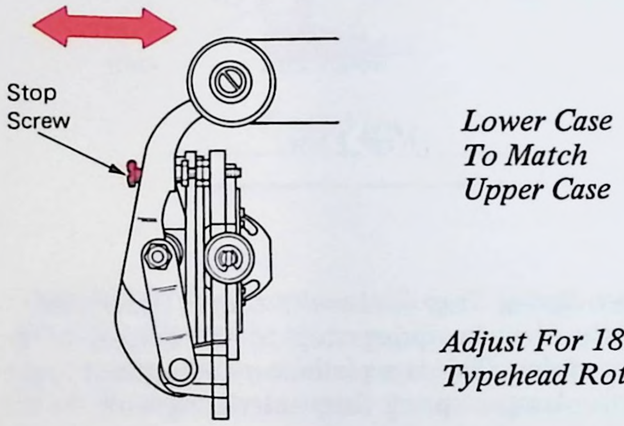
-3 Detent = -5 Detent

(Front View)

28. *Shift Motion* – Shift the machine into lower case so that the shift arm contacts its stop screw. Adjust the stop screw so that a lower case character detents EXACTLY the same as its upper case counterpart.

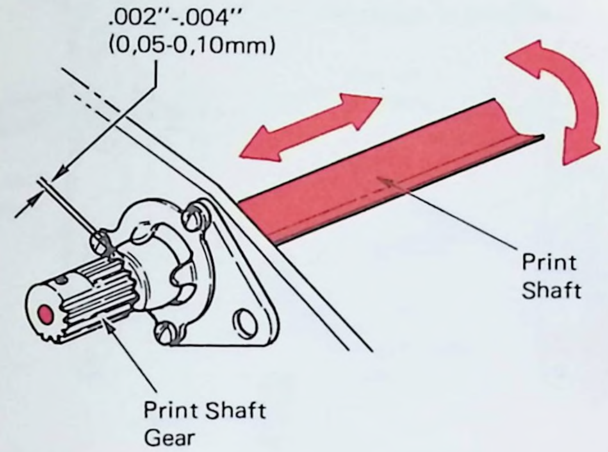


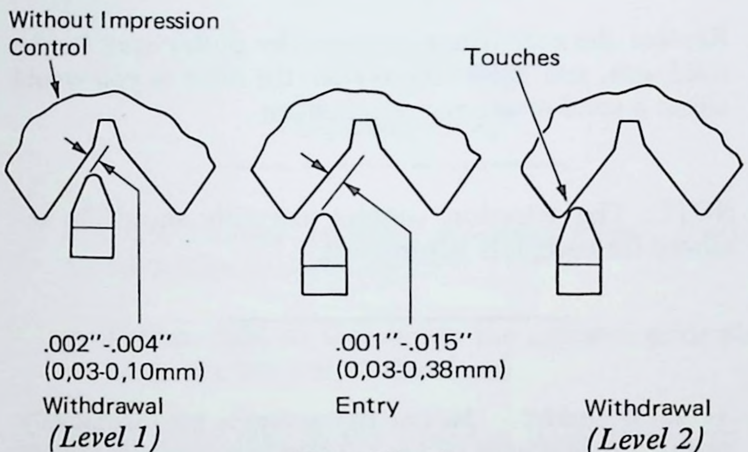
(Rear View Stamped Shift Arm)



(Rear View Die Cast Shift Arm)

29. *Print Shaft Timing Final* – Loosen the print shaft gear and advance or retard the print shaft so that the detent enters the proper tooth with .001"-.015" clearance. Remove the headplay from the typehead as a -5 character is slowly hand cycled. You should try to favor the low side of this adjustment. Also, the detent should withdraw with .002"-.004" clearance on level 1 (with wear compensator) and just touch on level 2. Be sure to maintain .002"-.004" end play in the print shaft.





(Rear View)

If difficulty is encountered in obtaining the correct detent timing, check the following items:

a. Detent skirt clearance – favor the high side of the tolerance (Fine Alignment Section).

b. Typehead homing – favor the high side of the tolerance.

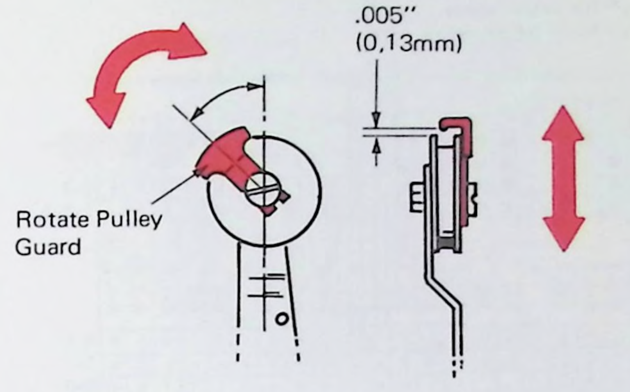
c. Bandwidth – make sure that it is not excessive.

d. Head play – it should be .050"-.060" measured at the typehead skirt. If excessive head play is suspected the dog bone should be replaced and the typehead homing adjustment refined.

CAUTION: Excessively advanced or retarded timing can cause parts damage as well as poor horizontal alignment or improper selection. This could happen if the detent entered the wrong notch or remained in the notch too long.

---

30. *Rotate Pulley Guard* – Adjust the rotate pulley guard rotationally at 45 degrees left of vertical. The guard must clear the rotate tape by .005" with the rotate arm in the negative 5 position.



(Front View) *(Left Side View)*

FINAL CHECK --- After completing the forgoing adjustments, a final check should be made to see if any refinements are necessary. Compare the detenting for the following character positions. +5 rotate, zero rotate, -1 rotate and -5 rotate.

If an excessive bandwidth exists (in excess of .015"), it will be greatest among these characters.

Excessive bandwidth between	is caused by:
Zero rotate and -1 rotate,	Incorrect balance
Plus 5 rotate and -5 rotate,	Rotate arm motion
-5, plus 5 and zero rotate	Latch stop pads and Neg 5 stop screw

If the bandwidth appears to be all right but the alignment is not satisfactory, check the following items:

Excessive play in the carrier or rocker.
Play or binds in the tilt or rotate detent.
Loose fitting upper ball socket.
Binds in the rocker parts.

The following chart may be used to determine the rotate and tilt locations of characters on typehead:

TYPEHEAD LAYOUT

T - #'s = Tilt latches active
R - #'s = Rotate latches active

	Upper Case											Lower Case											
	-5	-4	-3	-2	-1	0	+1	+2	+3	+4	+5	-5	-4	-3	-2	-1	0	+1	+2	+3	+4	+5	
B	■	■	■	■	@	>	■	■	■	:	√	1	3	5	7	8	Ø	2	4	6	9	'	T-0
C	■	■	■	‡	%	\	■	■	■	⁀	⧺	/	T	V	X	Y	ŧ	S	U	W	Z	,	T-1
D	■	■	■	!	⁂	;	■	■	■	]	△	J	L	N	P	Q	-	K	M	O	R	$	T-2
	■	■	■	?	⌑	>	■	■	■	[	‡	A	C	E	G	H	Ɛ	B	D	F	I	·	T-1,2
	R-5	R-5,1	R-5,2	R-5,2,1	R-5,2,2A	*	R-1	R-2	R-1,2	R-2,2A	R-1,2,2A	R-5	R-5,1	R-5,2	R-5,2,1	R-5,2,2A	*	R-1	R-2	R-1,2	R-2,2A	R-1,2,2A	
C	[	'	&	⁂	$	Z	@	%	¢	)	(	]	3	7	8	4	z	2	5	6	0	9	T-0
O	X	U	D	C	L	T	N	E	K	H	B	x	u	d	c	l	t	n	e	k	h	b	T-1
R	M	V	R	A	O	°	.	"	I	S	W	m	v	r	a	o	!	.	'	i	s	w	T-2
R	G	F	:	,	?	J	+	P	Q	Y	_	g	f	;	,	/	i	=	p	q	y	-	T-1,2
						HOME											HOME						

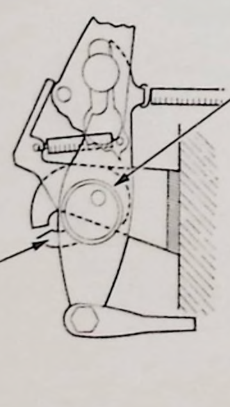
*With one exception, home position (Zero Rotate) selection on the 73 Series is identical to the 72 Series - i.e., no rotate latches are active. On the BCD machine, home position, during zero tilt only (Ø & >), is selected by the cancellation method - i.e., all rotate latches are active (see the Selection and Tilt Rotate Schedule

On the BCD machine only, the symbol > (Greater Than) may be used to check type head homing.

PROCEDURE FOR CRIPPLING COMPENSATOR-TYPE ROTATE ARMS

If difficulty is encountered in adjustment or operation of the compensator rotate arm, the following procedure can be used to convert it to a solid arm:

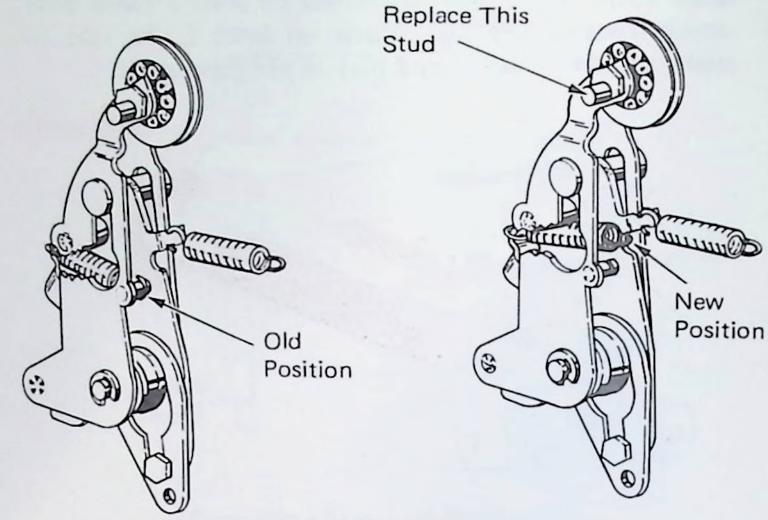
1. Break off the lug on the bottom of the eccentric rotate arm assembly.



(Front View)

2. Place the wear compensator wedge at the top of the slot.

3. Disconnect the spring from the rotate arm and connect it to the middle compensator arm assembly.

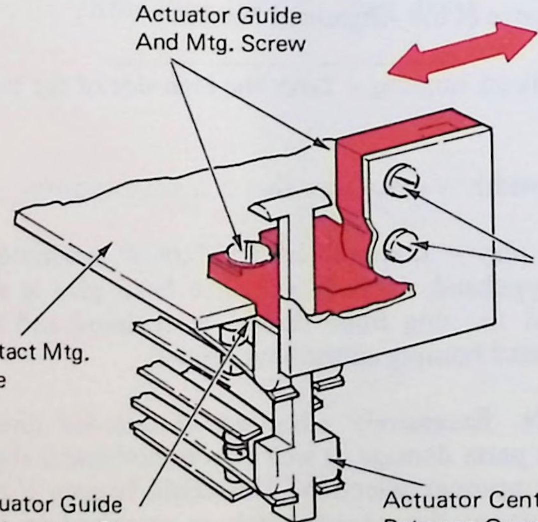


4. Replace the eccentric stud with the pulley stud for the solid arm, and adjust the system the same as you would adjust a solid rotate arm mechanism.

NOTE: The selection contact assembly should be removed for complete adjustment.

---

31. *Actuator Guides* – Mount the actuator guides squarely against the rear edge of the contact mounting plate with the actuators centered between the contact operating straps. The actuator guide and contact mounting screws must both be loosened for this inter-related adjustment.



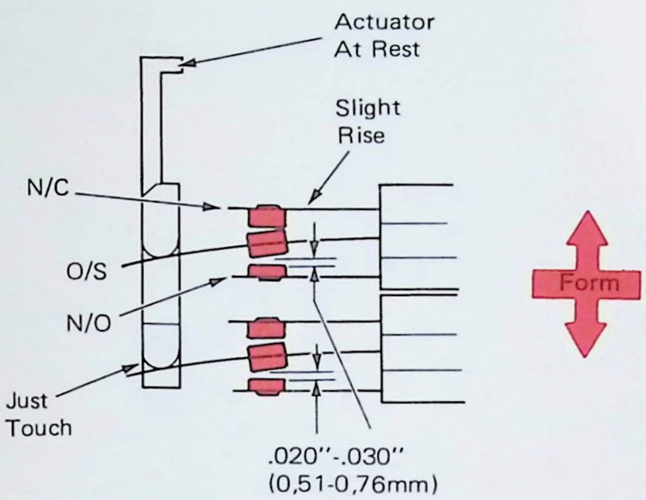
(Rear View)

32. *Contact Straps* – Form (actuators at rest) as required to satisfy the following conditions:

a. The O/S should just touch the actuator camming surface.

b. The O/S should produce a slight rise of the N/C straps.

c. The N/O to O/S clearance should be .020"-.030". The low end of the tolerance is preferable.

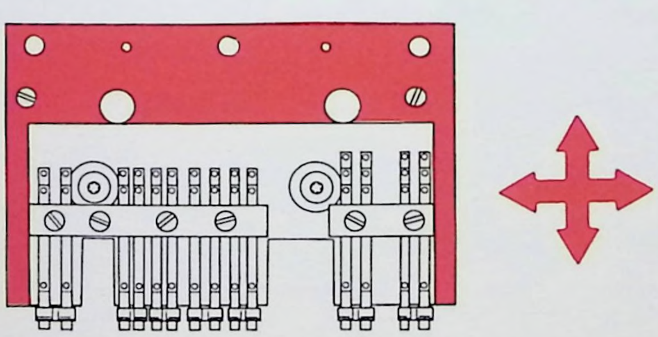


(Left Side View)

33. *Selection Contact Assembly Mounting Plate* – Position for the following conditions:

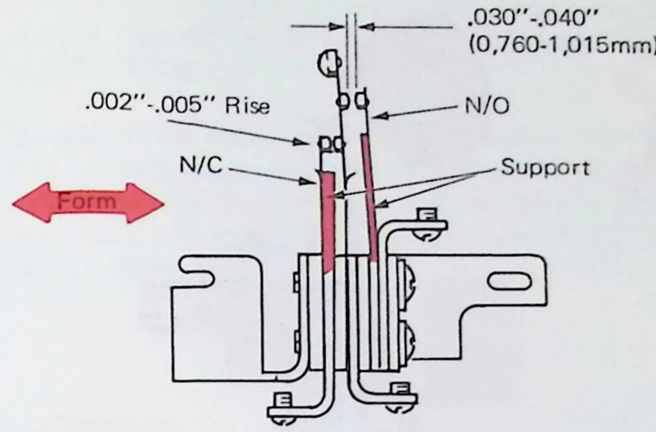
a. Left to right so the step in the actuator guide plate clears the left side of the -5 bail.

b. Front to rear so the selection latch extensions reliably contact and depress the contact actuators.



(Service Position – Bottom View)

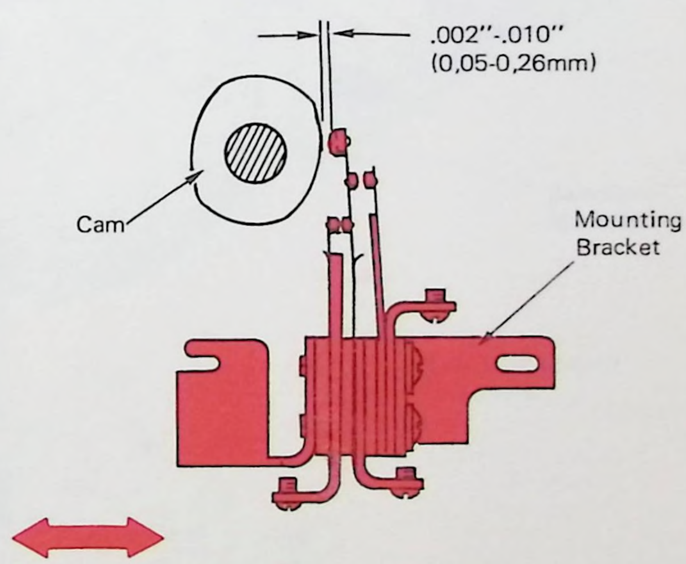
34. *C1 Contact Support* – Form so the O/S lifts the N/C .002"-.005" from its support, and for a .030"-.040" clearance between the O/S and the N/O.



(Left Side View)

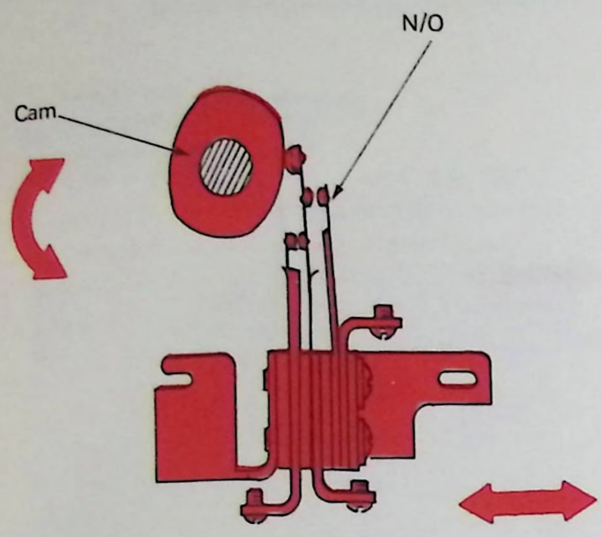
35. *C1 Contact Mounting Bracket* – Position so the O/S clears the cam (at the low point) by .002"-.010".

NOTE: Contacts C1 and C2 are mounted on tabs which extend away from the contact mounting bracket. These tabs can be adjusted to permit equalization of the O/S to cam clearance. C2 is described in the Character Selection (output) section.



(Left Side View)

36. *C1 Contact Cam* – Adjust the contacts for proper duration, and adjust the cam for proper contact timing.



(Left Side View)

Timing Chart			
C-1 N/O			
Machine	Make	Break	Duration (Make Time)
731	85° ±3	130° ±3	45°
735	85° ±3	130° ±3	45°
775	85° ±3	130° ±3	45°
MT/ST			

The purpose of the character selection output mechanism is to provide a means of initating a character selection cycle from some remote source. This is accomplished through the use of a latch pusher assembly, a selection magnet assembly and a cycle clutch trip mechanism. These assemblies function together, and control the tilt and rotate mechanisms to provide output character selection.

The operational theory for the cycle clutch is discussed in the Motor and Drive section. The operational theory for the Tilt and Rotate mechanisms is discussed in the Character Selection (input) section.

The selection magnet assembly is mounted to the left rear bottom of the power frame (Figure 1). This assembly consists of seven magnets, their armatures, and a cycle clutch trip bail. The magnets are, from left to right, T2, Check, T1, R2A, R1, R2, and -5.

The purpose of the selection magnets is to convert the electrical information received from an electronic device, to the mechanical motion needed to operate the character selection mechanism and control the cycle clutch. Cycle clutch control will be discussed first.

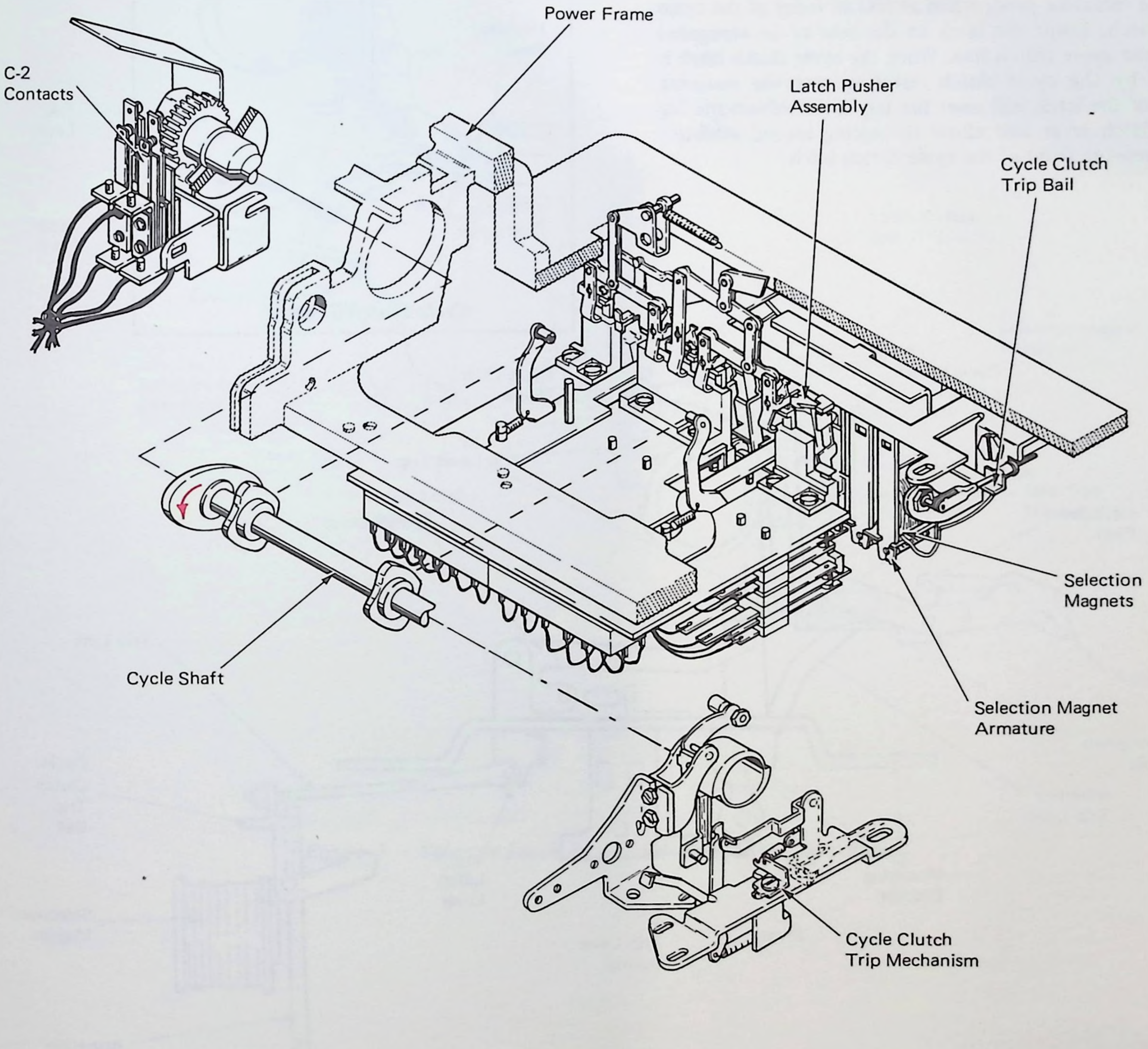
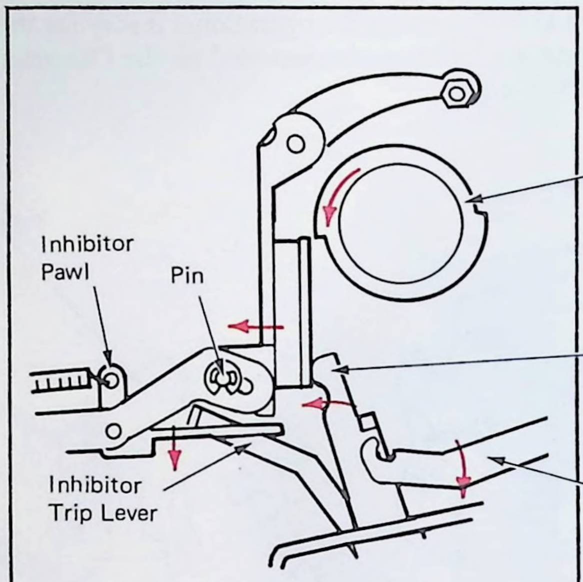


Figure 1 – Character Selection (Output)

CYCLE CLUTCH TRIP MECHANISM

When a selection magnet is energized, its armature is attracted toward the rear and contacts the cycle clutch trip bail (Figure 2). Continued armature movement causes the cycle clutch trip bail to pivot. An adjustable trip link is attached to the right end of the cycle clutch trip bail. The other end of this link is attached to the latch lever. The latch lever pivots on a mounting bracket that is attached to the bottom of the power frame directly below the cycle clutch. A lug on the forward extension of the latch lever holds the trip lever away from the cycle clutch latch. The trip lever is spring loaded toward the cycle clutch latch. As the latch lever pivots, it allows the trip lever and inhibitor trip lever to pull the inhibitor pawl out of the path of the cycle clutch and disengage the cycle clutch latch from the cycle clutch sleeve. This allows the cycle clutch spring to engage and drive the cycle shaft. (Cycle clutch theory is fully discussed in the Motor and Drive Section of this manual). The inhibitor pawl, when at rest in front of the cycle clutch latch, keeps the latch to the rear of an elongated hole in the cycle clutch link. When the cycle clutch latch is restored by the cycle clutch restoring cam, the restoring motion of the latch will reset the trip lever behind the lug on the latch lever and allow the spring loaded inhibitor pawl to reset in front of the cycle clutch latch.

The purpose of the inhibitor pawl and the elongated hole in the cycle clutch link is two fold: First, with the inhibitor pawl at rest, the elongated hole is effectively eliminated since the pin on the cycle clutch latch cannot move in the hole. Therefore, during an "input" operation the cycle clutch can be controlled by the keyboard. (Cycle clutch control during input is covered in the keyboard section). Second, with the inhibitor pawl operated, the pin on the cycle clutch latch is free to move in the elongated hole. This allows the cycle clutch trip mechanism to control the cycle clutch during an output operation.



Cycle Clutch Tripped

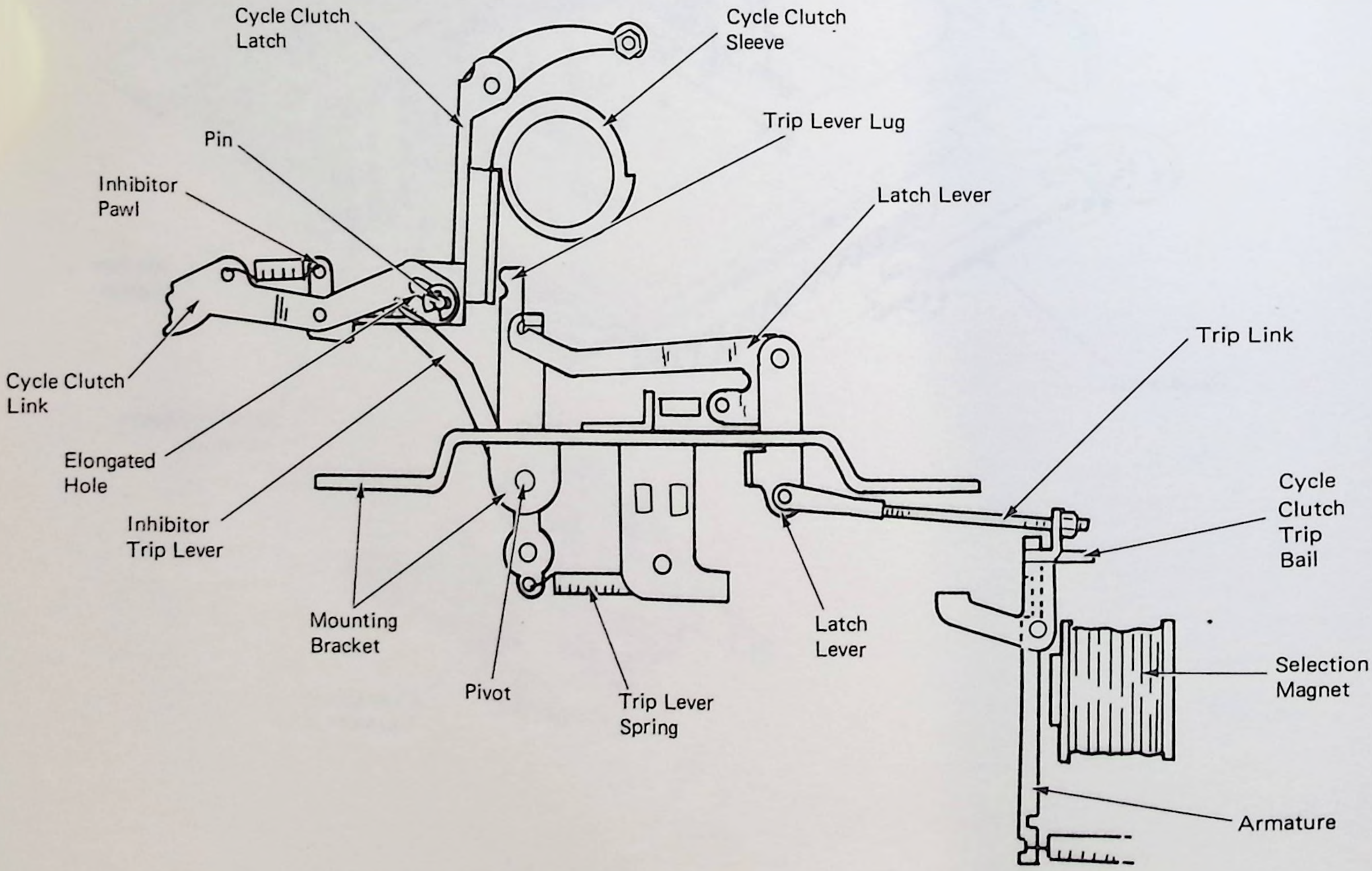


Figure 2 – Cycle Clutch Trip Mechanism (Right Side View)

SELECTOR LATCH PUSHER

The "Selectric" I/O Typewriter has two additional cams on the cycle shaft. These are latch pusher cams and are contacted by the latch pusher cam followers (Figure 3). When the cycle shaft begins to turn, these spring loaded cam followers raise the latch pusher bail. Further rotation of the cycle shaft will cause the pusher bail to move back down. The motion developed by the latch pusher cam followers is used to control the selector latch pusher assembly in the following manner.

There are seven selector latch pushers, one for each selector latch. The selector latch pushers are spring loaded toward the latch pusher bail. When the latch pusher bail rises, the tail of the pusher will follow if its corresponding magnet armature is attracted. As the selector latch pusher pivots on the shaft, the top of the pusher contacts the selector latch extension, and pushes the selector latch out of the path of the positive latch bail plate.

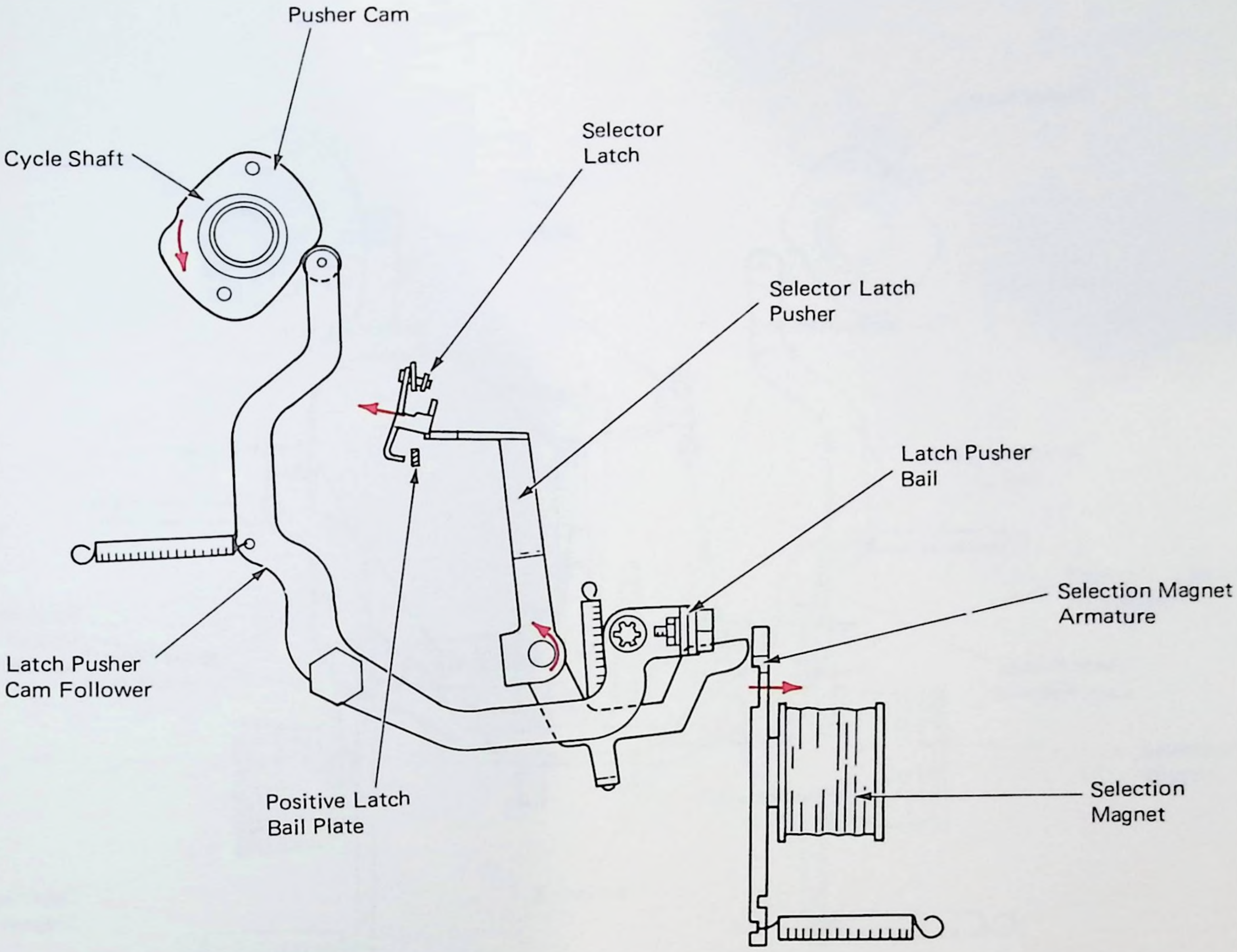


Figure 3 – Selector Latch Pusher Selected (Right Side View)

If a pusher's corresponding magnet armature has not been attracted, the pusher will not be able to pivot and the selector latch will not be pushed from under the positive latch bail (Figure 4). This is accomplished by the tail of the pusher contacting the latching surface of the armature as the pusher starts to rise. Because the armature keeps the tail of the pusher from rising, the pusher can not push the selector latch out from under the positive latch bail plate bail. Therefore the selector latch is left under the positive latch bail plate to be operated as the bail moves down.

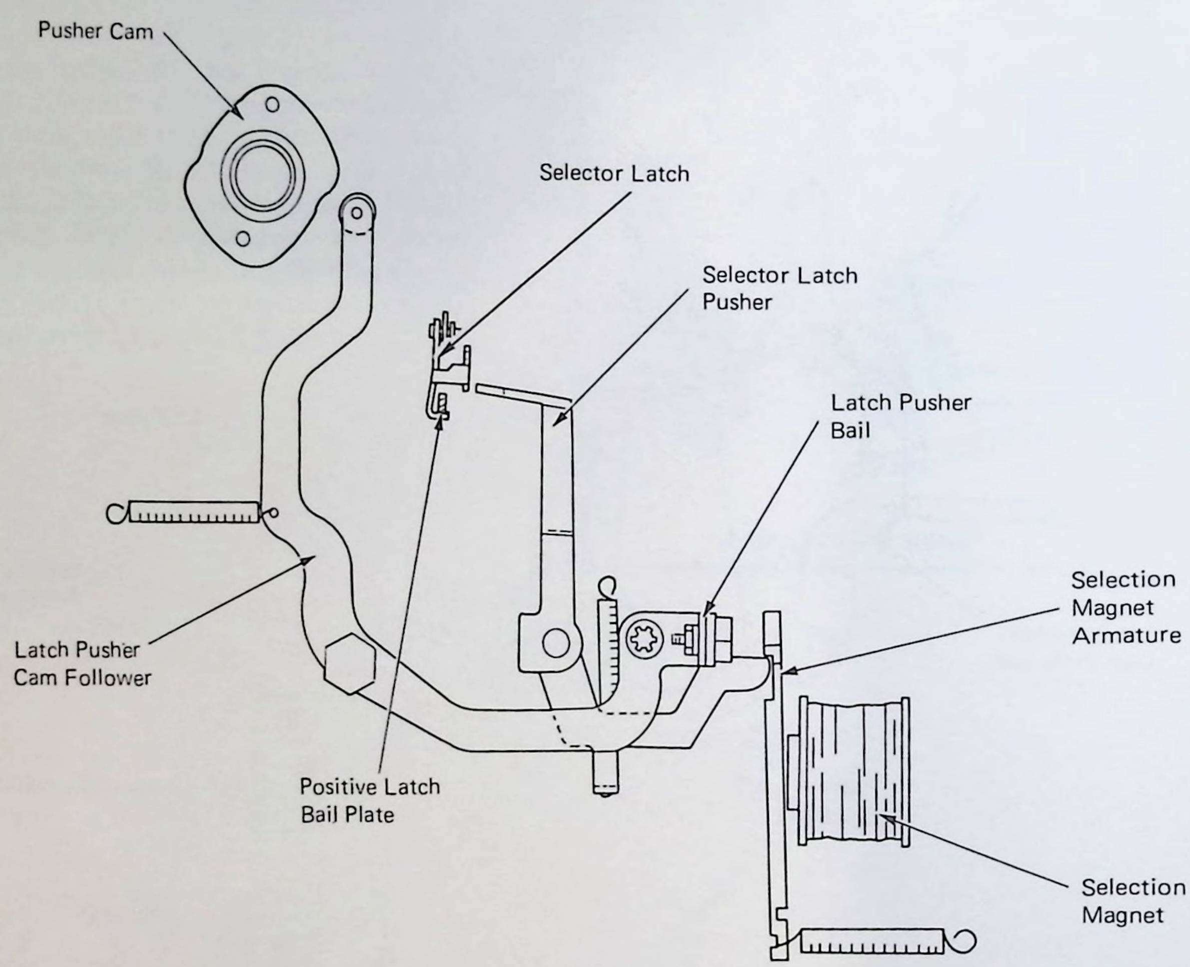


Figure 4 – Selector Latch Pusher Not Selected (Right Side View)

ARMATURE KNOCK-OFF

As the selection latch pushers are being returned to rest (Figure 5) an eccentric knock-off stud contacts an extension of the cycle clutch trip bail. This causes the cycle clutch trip bail to pivot forward and pull the selection magnet armatures away from the selection magnets. This knock-off action is needed due to residual magnatism in the armatures.

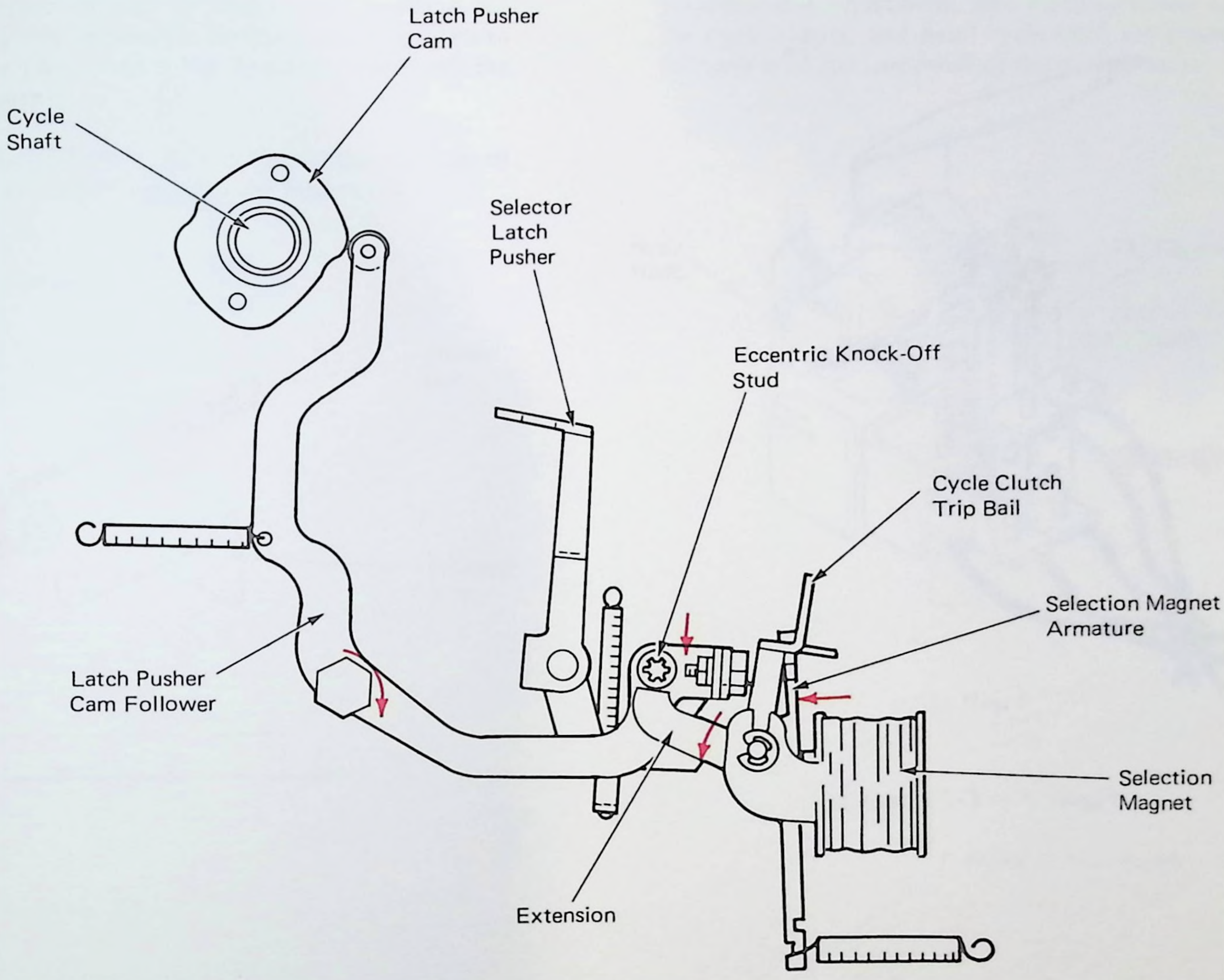


Figure 5 – Armature Knock-Off (Right Side View)

C-2 CONTACTS

A cam and the "C-2" contact located at the left end of the cycle shaft provides a means of gating the incoming pulses to the selection magnets (Figure 6). The normally closed (N/C) point of this "C-2" contact should be used to initiate succeeding character cycles for maximum operating speed. The use of "C-2" and its relationship to other C contacts is discussed in the Electrical Section.

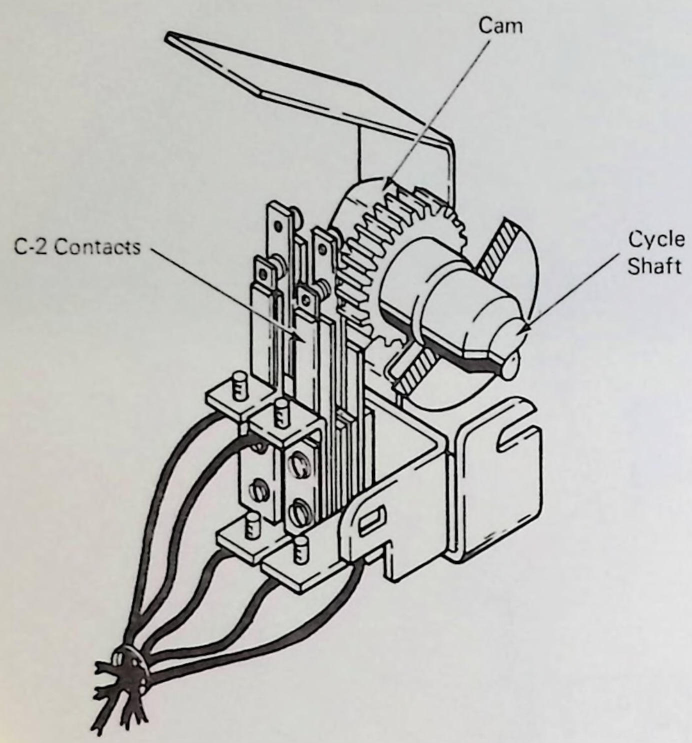


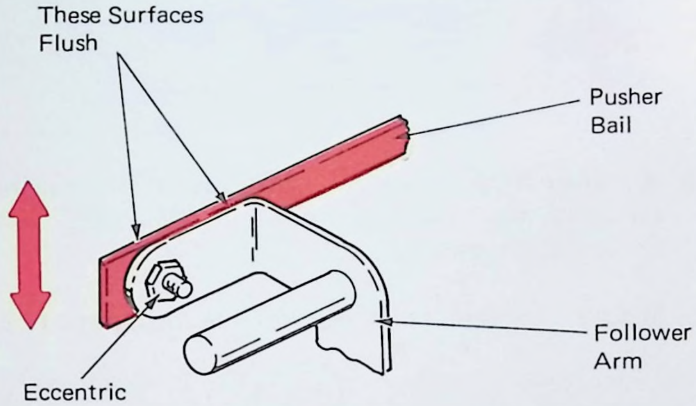
Figure 6 – C-2 Contacts

CHARACTER SELECTION (OUTPUT) ADJUSTMENTS

NOTE: The selector latch link adjustments (described in the Character Selection input section) must be correct before making any pusher to latch extension adjustments.

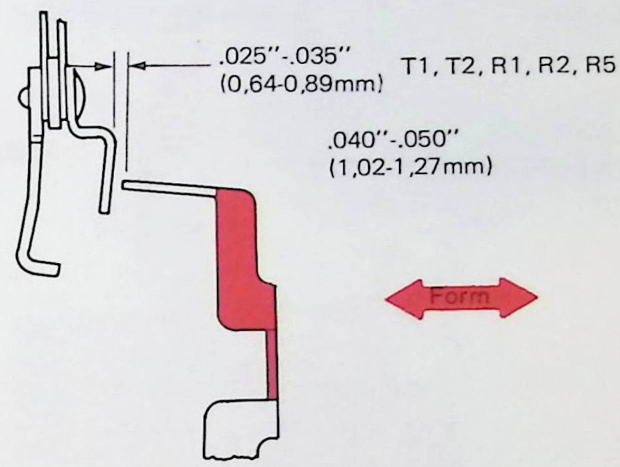
When removal of the Latch Pusher Assembly is required, scribe (for reinstallation reference) the pusher plate to power frame relationship. If the original relationship can be maintained, the adjustments will not have been destroyed by removal. In case of loss of relationship, position the pusher plate as nearly as possible for the prescribed latch to pusher clearances (Adjustment No. 2) and proceed with the following adjustments.

1. *Pusher Bail Eccentrics* – Adjust so that the top edge of the follower arms are flush with the pusher bail.

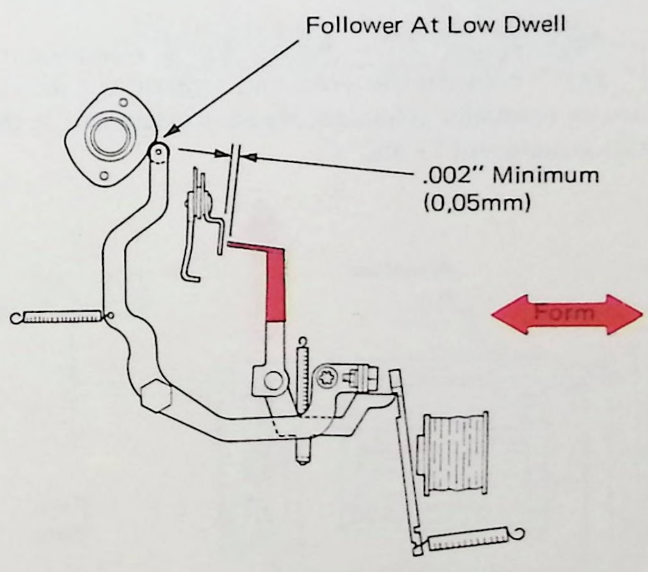


---

2. *Latch Pushers* – Form to clear their respective latch extensions by .025"-.035". The R2A pusher should clear its latch extension by .040"-.050". Malselection or parity errors may be caused by the latch pushers contacting their latch extensions when an unselected pusher is against its armature. There should be a minimum of .002" clearance between the pusher and the latch extension when the pusher is against its armature. To check this adjustment, turn machine power off, trip the cycle clutch, and hand cycle until the pusher cam follower is on the low dwell of the pusher cam.



(At Rest)



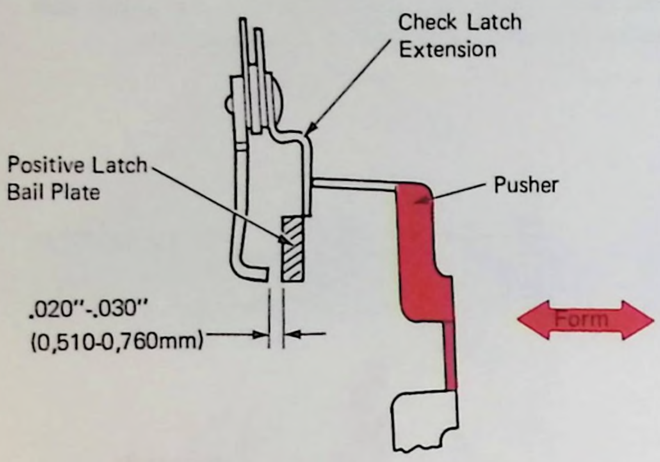
(Not Selected)

(Right Side View)

---

3. *Check Latch Pusher* – Form so that the check latch clears the positive latch bail plate by .020"-.030". This clearance must be observed with the positive latch bail lowered slightly.

Adjustments 2 and 3 along with the Print Magnet armature to Pusher adjustments ensure that the pushers will not contact the latch extensions when the latches are active (pulled down by the bail).

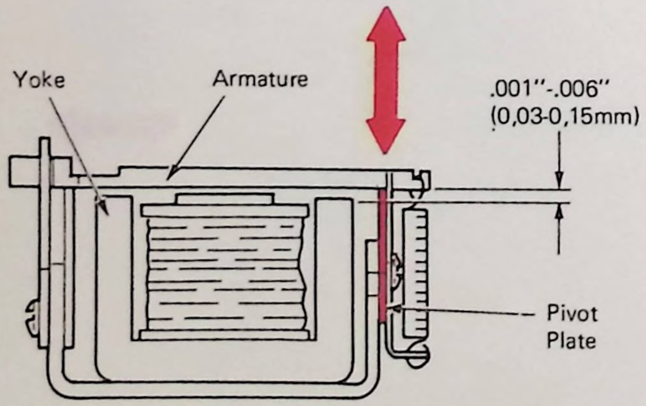


(Right Side View)

SELECTION MAGNET ASSEMBLY LEVEL 1

NOTE: The level 1 magnet assembly may be identified by presence of pivot eccentrics and two knock-off extensions.

4. *Pivot Plate (Level 1)* – Adjust for a clearance of .001"-.006" between the yoke and armatures with the armatures manually attracted. Measure clearances at the outside armatures (T2 and -5).

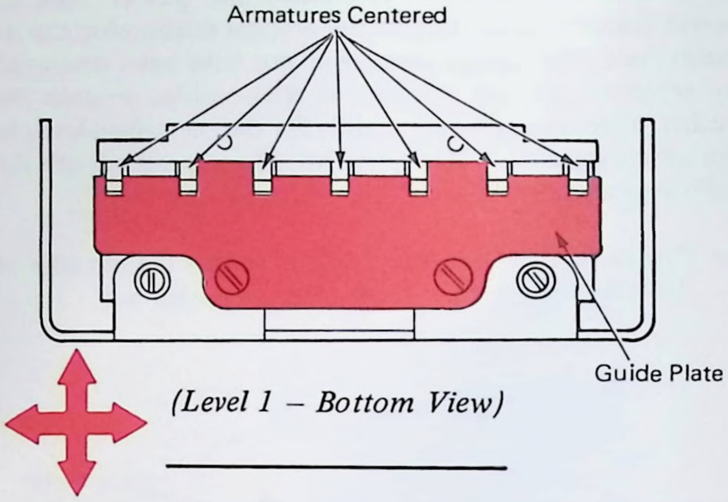


(Level 1 – Left Side View – Service Position)

5. *Guide Plate (Level 1)* – Position:

(a) Vertically – to provide equal spring tension on all armature springs.

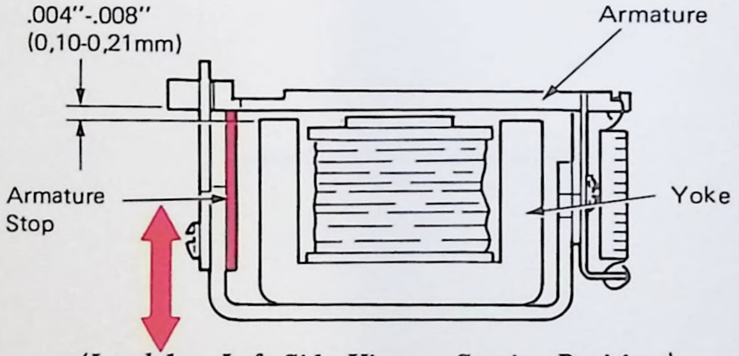
(b) Horizontally – so that all armatures are centered in the guide slots.



(Level 1 – Bottom View)

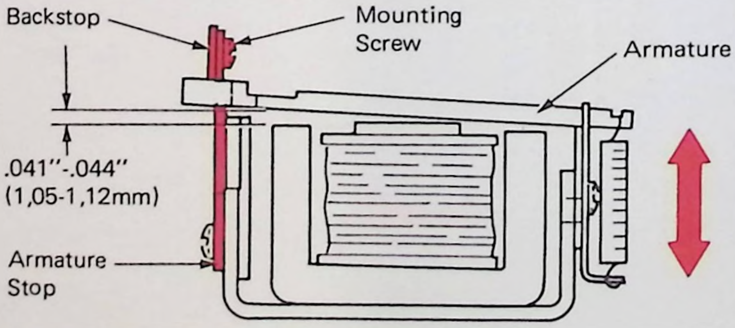
6. *Armature Stop (Level 1)* – With the armature manually attracted, adjust for a clearance of .004"-.008" between the armatures and yokes.

Measure Clearances at the outside armatures (T2 and -5).



(Level 1 – Left Side View – Service Position)

7. *Back Stop (Level 1)* – Position vertically (with armatures at rest) for a clearance of .041"-.044" between the armature stop and armatures. Measure clearance at the outside armatures (T2 and -5).

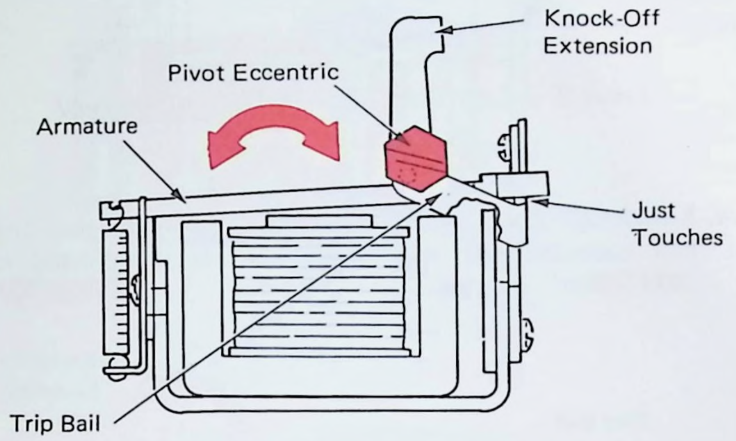


(Level 1 – Left Side View – Service Position)

8. *Pivot Eccentrics (Level 1)* – Adjust so that the cycle clutch trip bail is parallel to the armatures.

While holding the trip bail against the armatures, check the center armatures to be sure they are touching the trip bail or clear it by a maximum of .002". Excessive clearance can cause extra cycles.

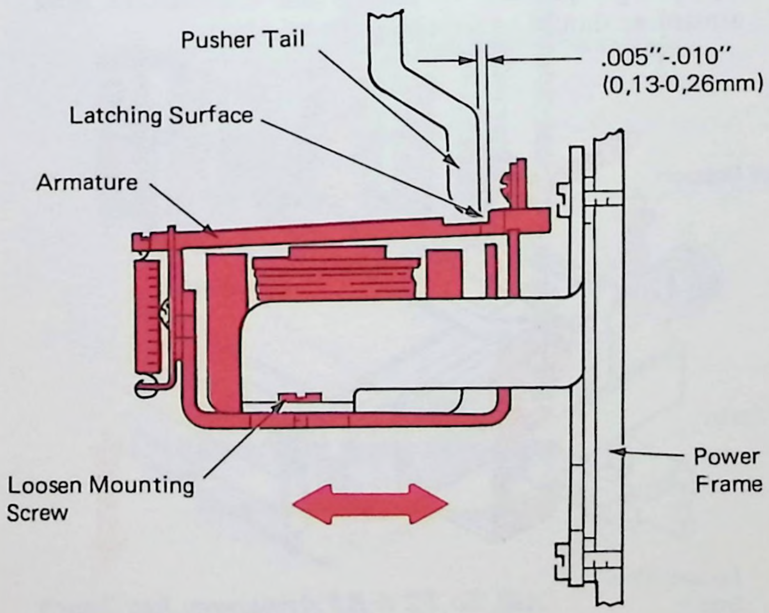
NOTE: The high point of the pivot eccentrics must be toward the top (paper feed area) of the machine.



(Level 1 – Right Side View – Service Position)

9. *Magnet Assembly (Level 1)* – Position under its two mounting screws for .005"-.010" clearance between the pusher tails and armature latching surfaces (armatures at rest).

This adjustment ensures that the pusher does not contact its latch extension when the pusher is against its armature during a print cycle. If allowed to touch mal-selection will result.



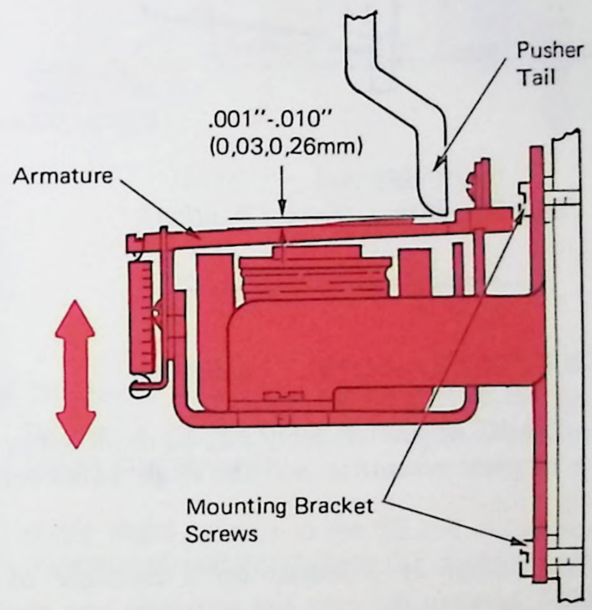
(Right Side View – Service Position)

10. *Mounting Bracket (Level 1)* – Position under its four mounting screws for .001"-.010" clearance between the pusher tails and armatures.

NOTE: Adjustments 9 and 10 are interacting – both requirements must be satisfied.

Excessive clearance may cause mal-selection since the armature may not hold the pusher tail when the magnet is not energized.

No clearance (the pusher holding the armature away from rest) can cause mal-selection since the pusher may not be released when the armature is attracted by its magnet. Also extra cycles may result since the armature at rest would be holding the cycle clutch trip bail partially rotated.

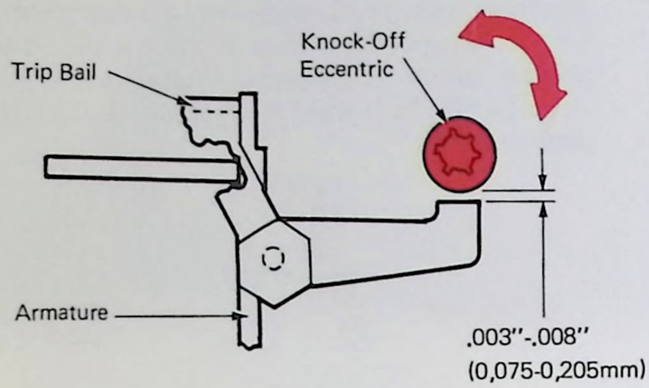


(Right Side View – Service Position)

11. *Knock Off Eccentrics (Level 1)* – Adjust (T2 and -5 armatures manually attracted) to clear the trip bail extensions by .003"-.008".

Excessive clearance will cause extra cycles due to the armatures not being knocked off. It is necessary to knock off the armatures since residual magnetism is present.

No clearance will cause failure to cycle because the trip bail will not be able to rotate to trip the cycle clutch.



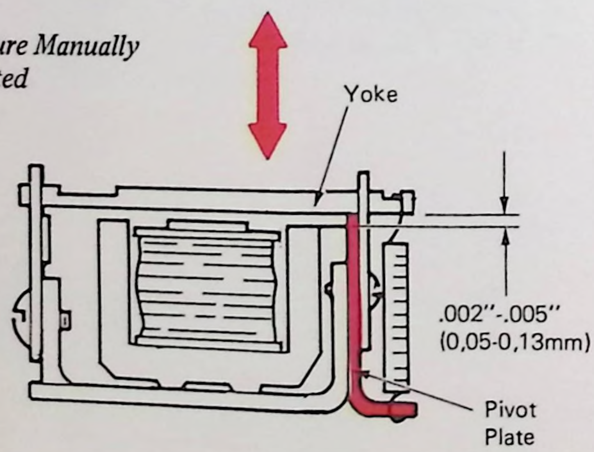
(Left Side View – Service Position)

SELECTION MAGNET ASSEMBLY LEVEL 2

NOTE: The Level 2 magnet assembly may be identified by the absence of pivot eccentrics, and the single knock-off extension.

12. *Pivot Plate (Level 2)* – Adjust for a clearance of .002"-.005" between the yoke and armatures with the armatures manually attracted. Measure clearance of the outside armatures (T2 and -5).

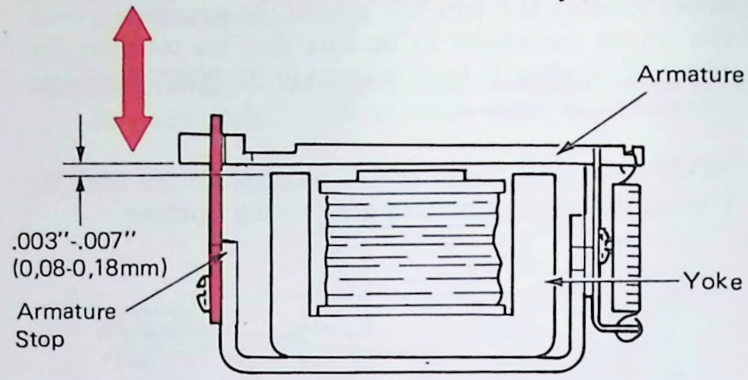
Armature Manually Attracted



(Level 2 – Left Side View – Service Position)

---

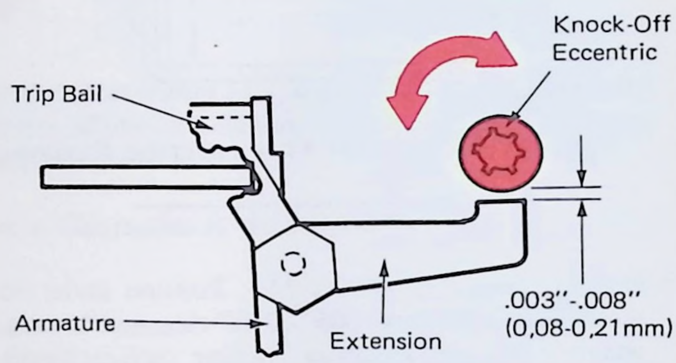
13. *Armature Stop (Level 2)* – With the armature manually attracted, adjust armature stop for a clearance of .003"-.007" between the armature and yoke.



(Level 2 – Left Side View – Service Position)

---

14. *Knock-Off Eccentric (Level 2)* – The redesigned trip bail contains only one extension. It is adjusted to .003"-.008" as shown.

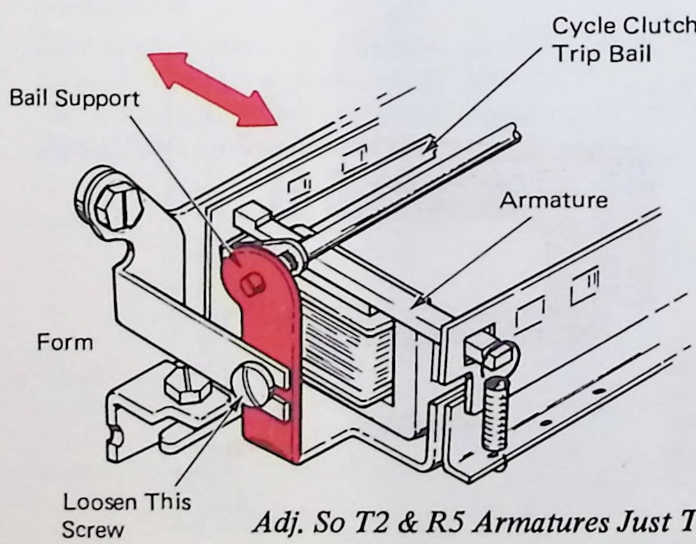


(Level 2 – Left Side View – Service Position)

---

15. *Trip Bail* – Adjust the bail support so the cycle clutch trip bail is parallel to the armatures. The following procedure may be used:

Apply slight pressure to the T2 and -5 armatures. Both armatures should be touching the trip bail.

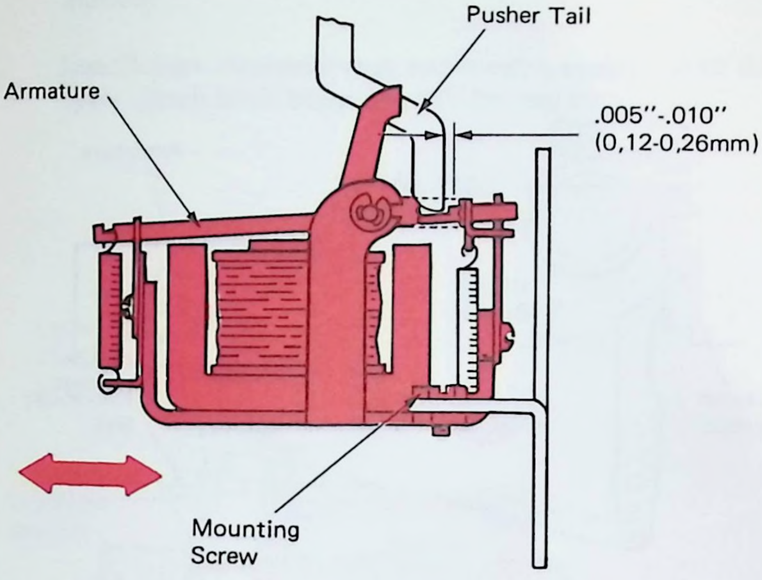


Adj. So T2 & R5 Armatures Just Touch

(Bottom View)

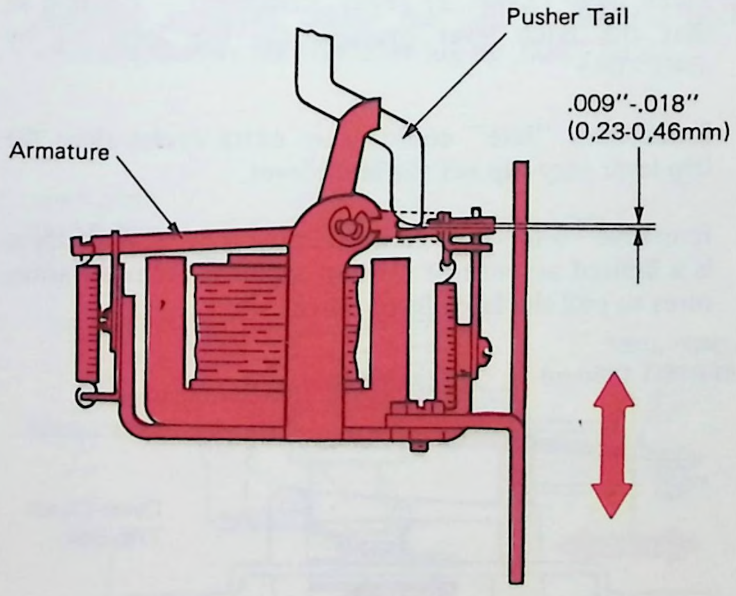
---

16. *Magnet Assembly* – Position under its two mounting screws for .005"-.010" clearance between the pusher tails and the armature latching surfaces (armatures at rest).



(Level 2 – Right Side View)

17. *Mounting Bracket* – Position under its four mounting screws for .009"-.018" clearance between the pusher tails and armatures.

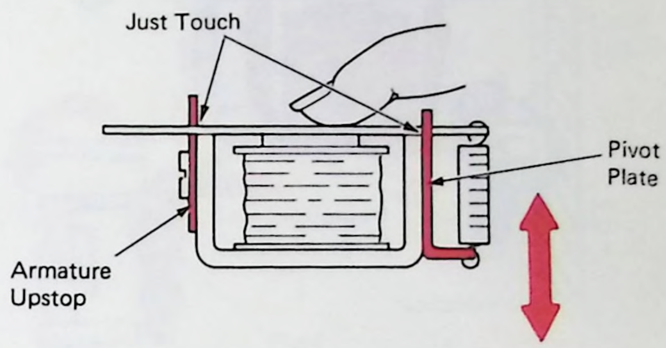


(Level 2 – Right Side View)

SELECTION MAGNET ASSEMBLY LEVEL 3

Level 3 can be identified by the wide armatures and the holes instead of steps where the pushers latch against them.

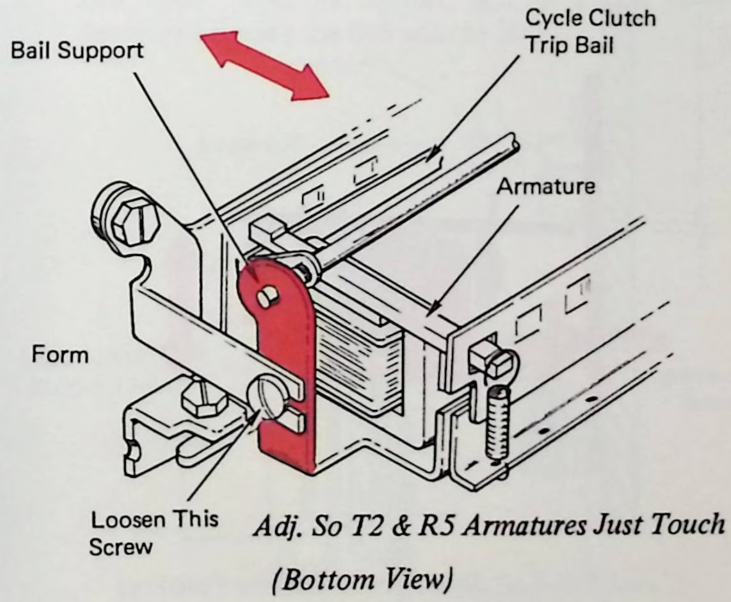
18. *Armature Pivot Plate and Armature Upstop (Level 3)* – Loosen the pivot plate and upstop mounting screws, hold the -5 and T2 armatures against their magnet pole pieces, and then adjust the pivot plate and armature upstop so they just touch the armatures.



(Level 3 – Left Side View)

19. *Trip Bail* – Adjust the bail support so the cycle clutch trip bail is parallel to the armatures. The following procedure may be used:

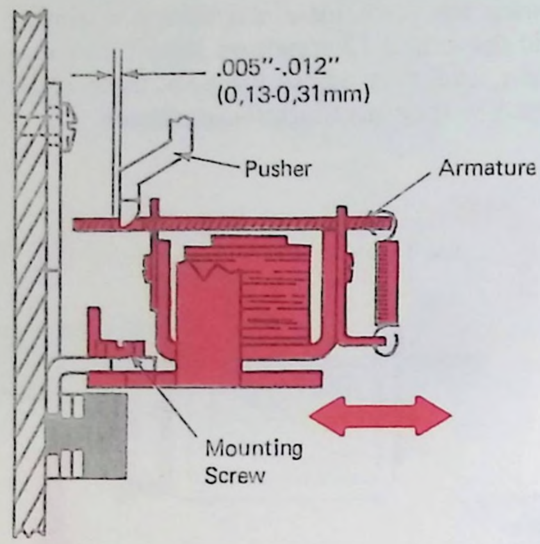
Apply slight pressure to the T2 and -5 armatures. Both armatures should be touching the trip bail.



Adj. So T2 & R5 Armatures Just Touch

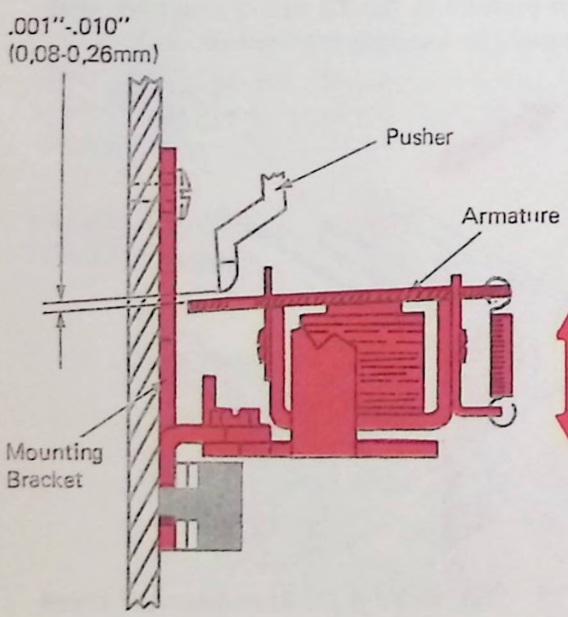
(Bottom View)

20. *Magnet Assembly (Level 3)* – With the machine at rest, position the magnet unit under its two mounting screws for .005"-.012" clearance between the pushers and their latching surface in the armature windows.



(Level 3 – Left Side View – Service Position)

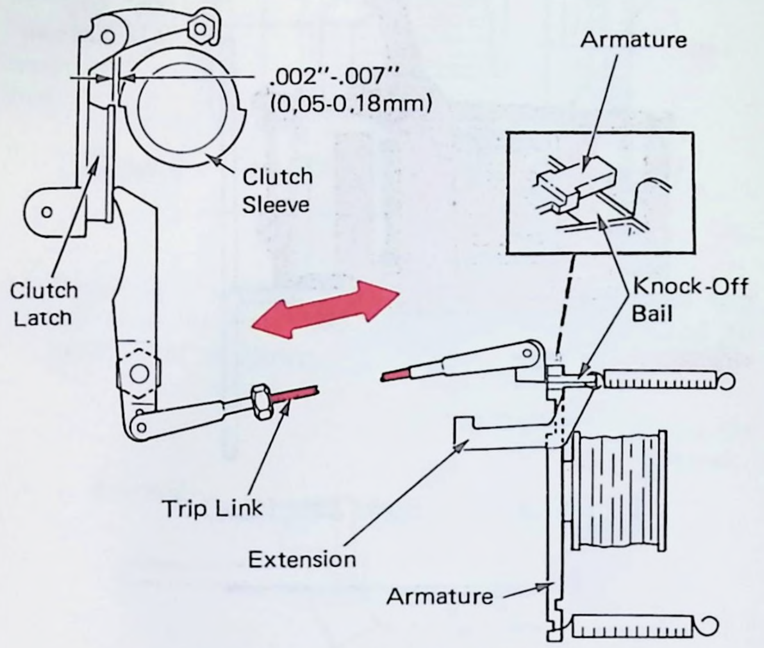
21. *Mounting Bracket (Level 3)* – Position under its four mountings screws so when any armature is held depressed, there will be .001"-.010" clearance between the end of the pusher and the armature.



(Level 3 – Left Side View – Service Position)

CYCLE CLUTCH TRIP MECHANISM LEVEL 1

22. *Trip Link (Level 1)* – Hold a print magnet armature attracted and adjust the cycle clutch trip link clevis to move the cycle clutch latch .002"-.007" away from the clutch sleeve.



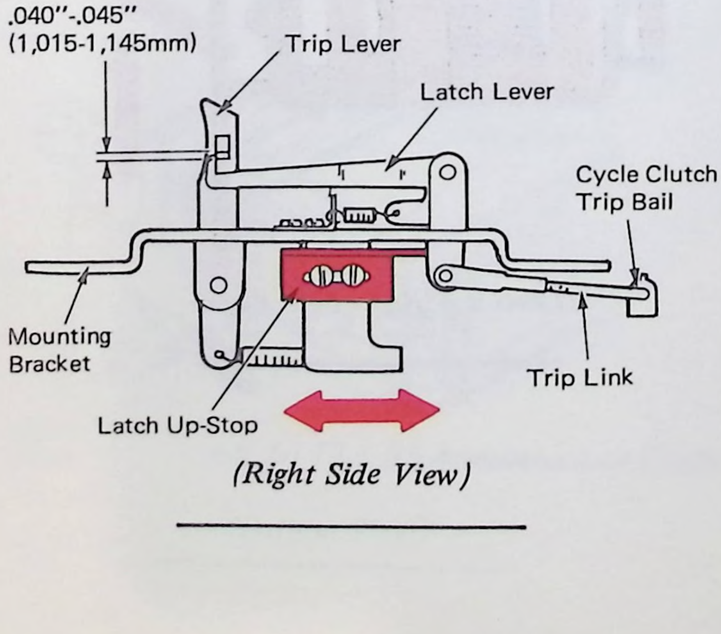
(Level 1 – Right Side View)

CYCLE CLUTCH TRIP MECHANISM LEVEL 2

23. *Latch Stop (Level 2) (Unit Removed)* – Position so that the latch lever overlaps the trip lever lug by .040"-.045".

Insufficient "bite" could cause extra cycles since the trip lever may slip off the latch lever.

Excessive "bite" may cause failure to cycle since there is a limited amount of motion available from the armatures to pull the latch lever down.

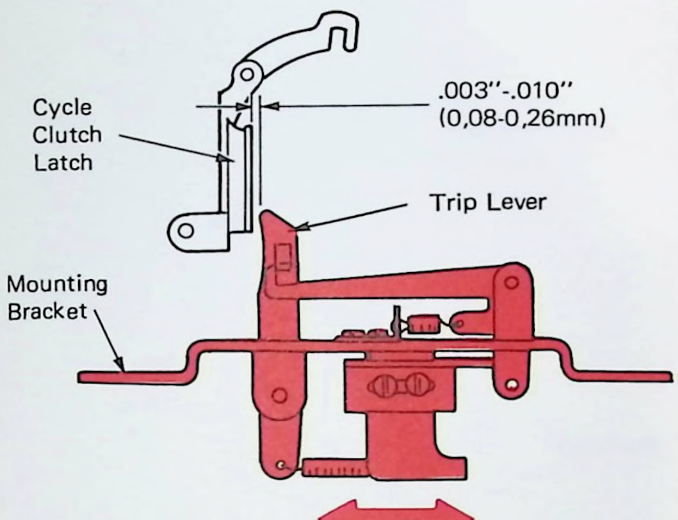


(Right Side View)

24. *Mounting Bracket (Level 2) (Unit Installed)* – Position front to rear so that the trip lever clears the cycle clutch latch by .003"-.010.

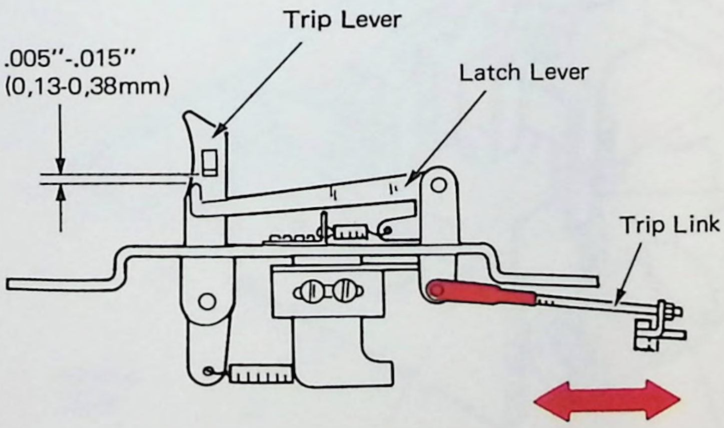
Excessive clearance may cause extra cycles since the trip lever is restored by the cycle clutch latch restoring motion.

Insufficient clearance may cause extra cycles due to the cycle clutch latch bouncing off the trip lever.



(Right Side View)

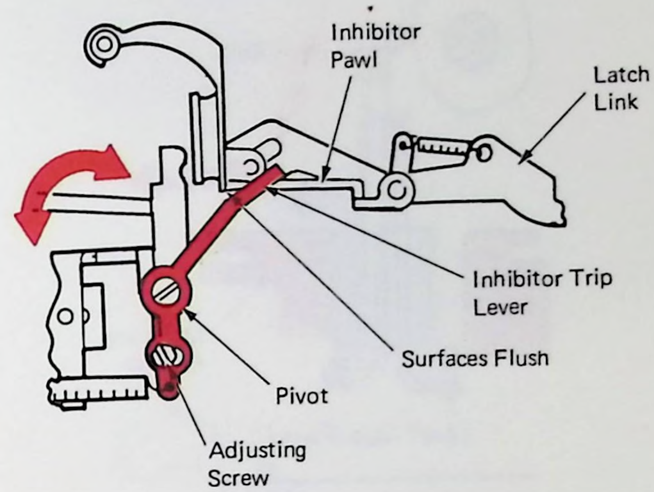
25. *Trip Link (Level 2)* – With either the T2 or -5 armature manually attracted, adjust the link so that the latch lever overthrows the trip lever lug by .005"-.015".



(Level 2 – Right Side View)

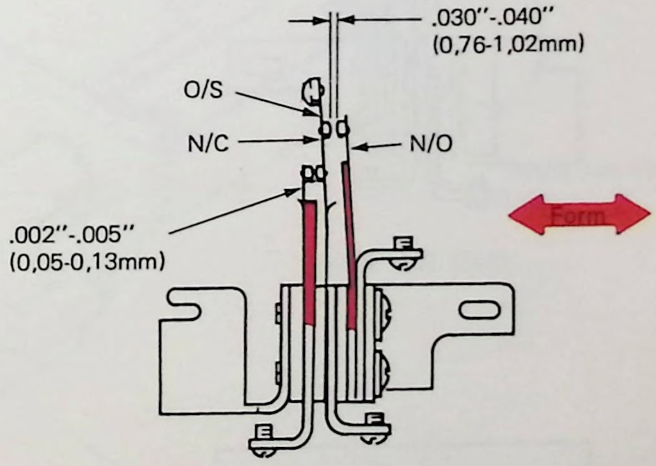
26. *Inhibitor (Level 2)* – Adjust the inhibitor trip lever so that the bottom edge of the inhibitor pawl is flush with the bottom edge of the cycle clutch latch with all parts at rest.

This adjustment provides an adequate "bite" between the cycle clutch latch and inhibitor pawl to prevent extra cycles.



(Left Side View)

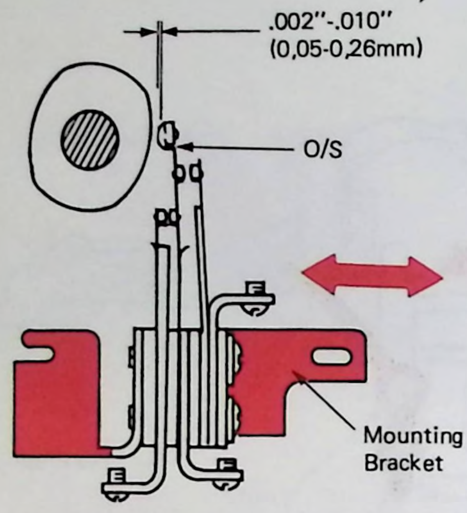
27. *C2 Contact Support* – Form so the O/S lifts the N/C .002"-.005" from its support, and for a .030"-.040" clearance between the O/S and the N/O.



(Left Side View)

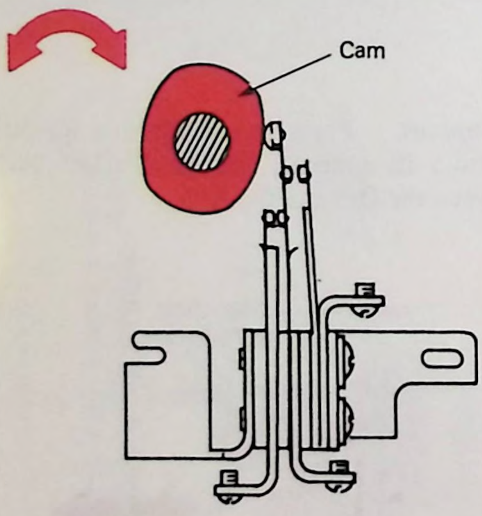
28. *C2 Contact Mounting Bracket* – Position so the O/S clears the cam (at the low point) by .002"-.010".

Note: The contacts C1 and C2 are mounted on tabs which extend away from the contact mounting bracket. These tabs can be adjusted to permit equalization of the O/S to cam clearance. C1 is described in the character selection (input) section.



(Left Side View)

29. *C2 Contact Cam* – Adjust the contact for proper duration and adjust the cam for proper contact timing.



(Left Side View)

C-2 N/C		
Machine	Break	Make
721	20° ±3	120° ± 3
735	20° ±3	120° ± 3
775	20° ± 3	120° ± 3

FINE ALIGNMENT OPERATIONAL THEORY

Fine alignment is defined as locking and supporting the typehead in place so that the desired character will print clearly. In this section we will discuss how the typehead is detented and locked into position for printing. The desired character is brought to the approximate print position in front of the platen by the selection mechanism. Just prior to printing, the typehead must be detented in position both horizontally and vertically. After the print operation occurs, the tilt and rotate detents are withdrawn, allowing the selection mechanism to return the typehead to rest (Figure 1).

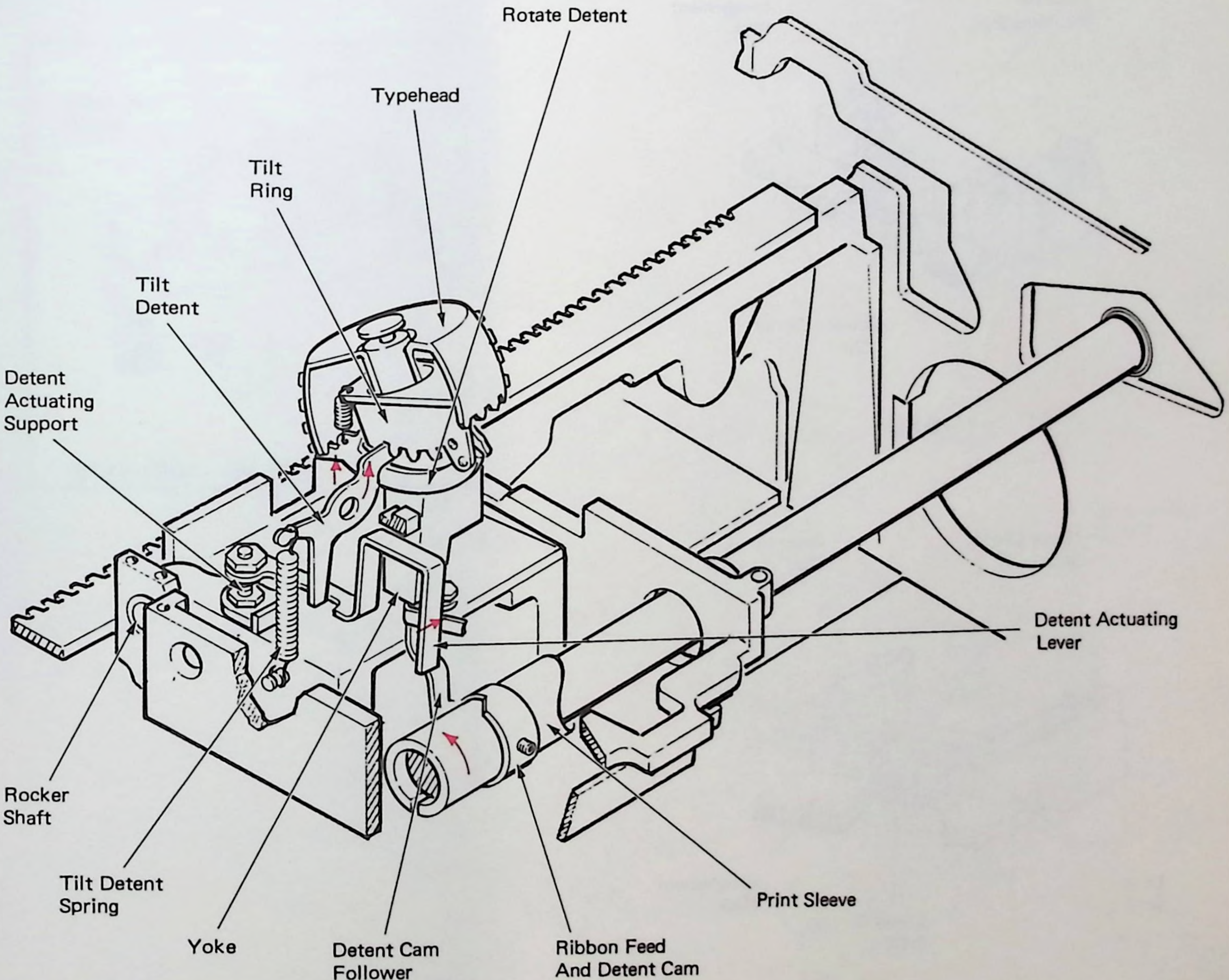


Figure 1 – Tilt And Rotate Detents

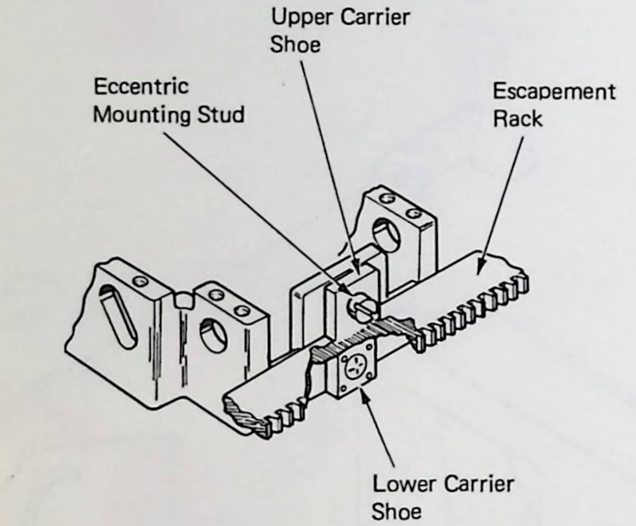
REAR CARRIER SUPPORT

The rear of the carrier is supported by the front edge of the escapement rack. The carrier has two shoes, an upper carrier shoe and a lower carrier shoe (Figure 2).

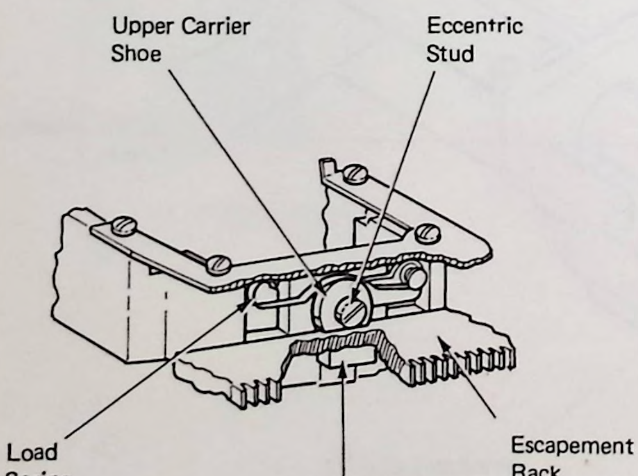
There are two levels of rear carrier supports. On the level 1 support the lower shoe is a small block fastened to a plate and mounted on the carrier. The upper carrier shoe is mounted by an eccentric stud.

On the level 2 support the lower shoe is attached to a plate which is attached to the carrier by the eccentric stud that mounts the upper carrier shoe.

Machines equipped with the dual velocity print mechanism also have a load spring which exerts a constant pressure on the upper carrier shoe and removes the play between the lower carrier shoe and the bottom of the escapement rack.



(Level 1)



(Level 2)

Figure 2 – Rear Carrier Support

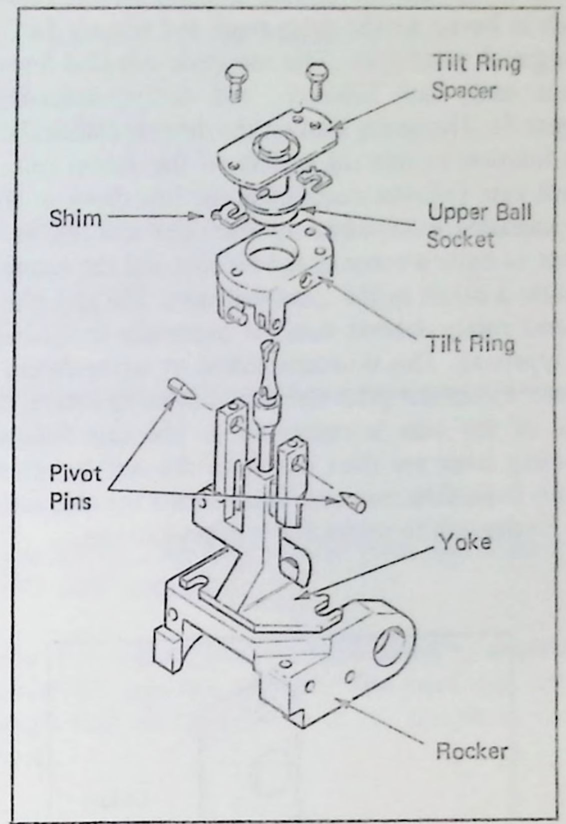
ROCKER

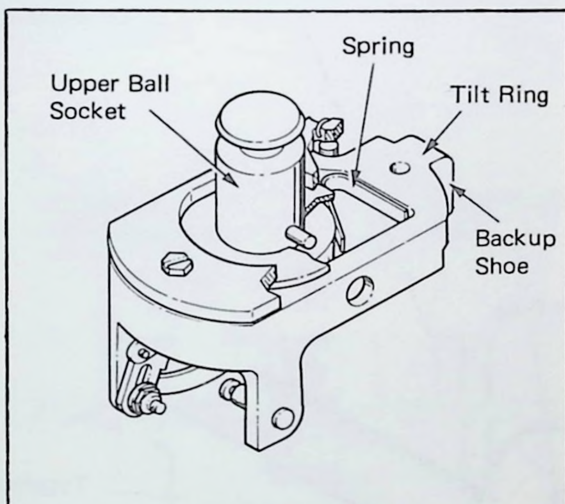
Located within the rear portion of the carrier is the rocker (Figure 3). The rocker assembly pivots about the rocker shaft at the rear of the carrier.

Attached solidly to the top of the rocker platform is the yoke (Figure 3). The yoke has two arms that extend up to provide a mount for two pivot pins. The pivot pins are adjusted to provide a tight pivot point for the tilt ring. Mounted at the top of the tilt ring is the upper ball socket to which the typehead is attached. The upper ball socket must be a tight fit with no binds. This is achieved by using shims under the tilt ring spacer.

The level 2 tilt ring has an elongated hole to allow the upper ball socket to be spring loaded to the front of the machine. This keeps the tilt ring backup shoe in contact with the inside of the element providing a more consistent print impact.

On the level 1 tilt ring the hole is not elongated to allow front to rear motion.





Spring Biased Tilt Ring (Level 2)

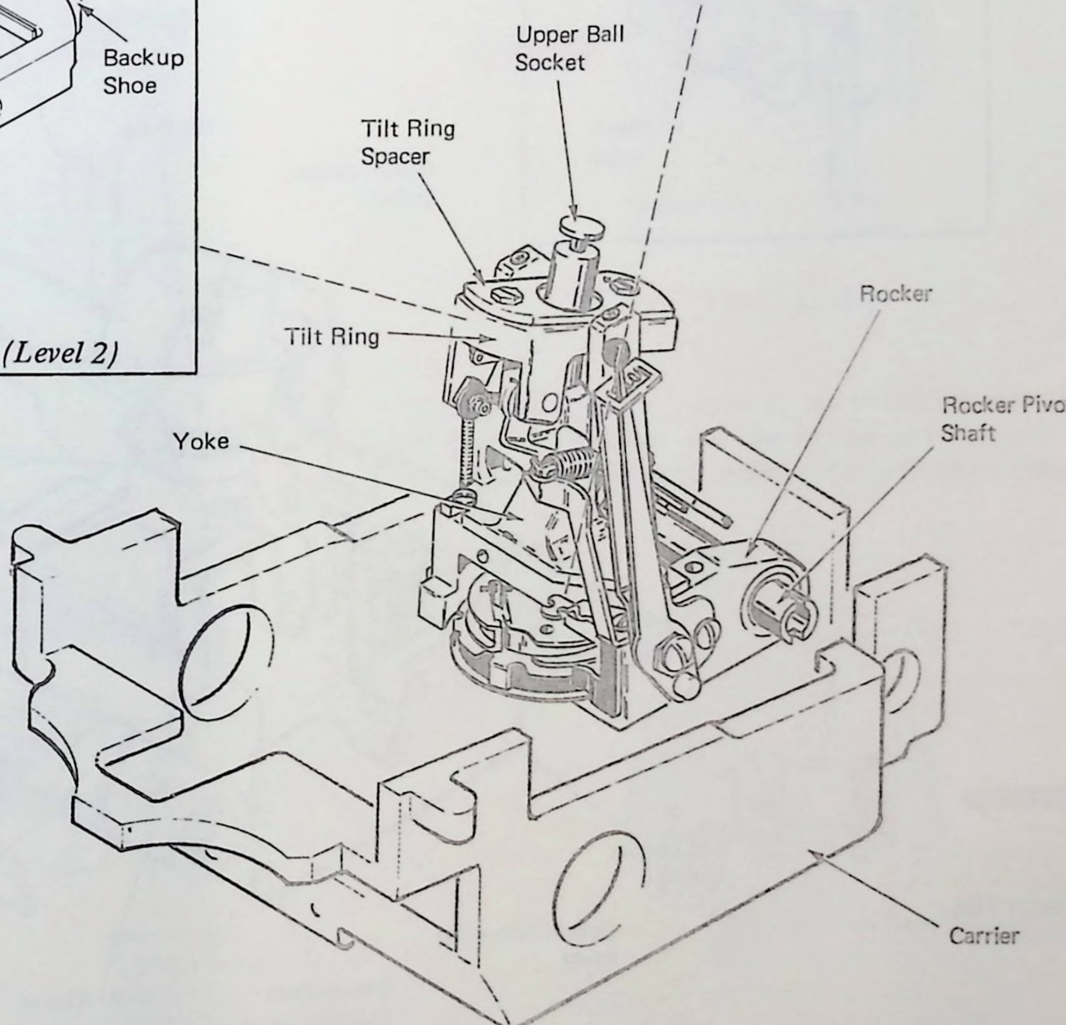


Figure 3 – Rocker Assembly

Motion to operate the detents is taken off the print sleeve which is keyed to the print shaft and rotates 360 degrees during each print cycle. This motion is coupled through the detent cam, cam follower, and detent actuating lever (Figure 4). The spring load on the detents causes the detent cam follower to ride the surface of the detent cam. As the detent cam follower encounters the low dwell of the cam, the actuating lever moves to the right and allows the tilt detent to enter a notch in the tilt ring and the rotate detent to enter a notch in the typehead skirt. The side play in the tilt and rotate detents must be minimum to securely lock the typehead. This is accomplished by using detent guides (Figure 4). As the print sleeve continues to rotate, the high dwell of the cam is encountered. The cam follower and actuating lever are then driven to the left to remove the detents from their notches. This permits the character selection mechanism to return the typehead to rest.

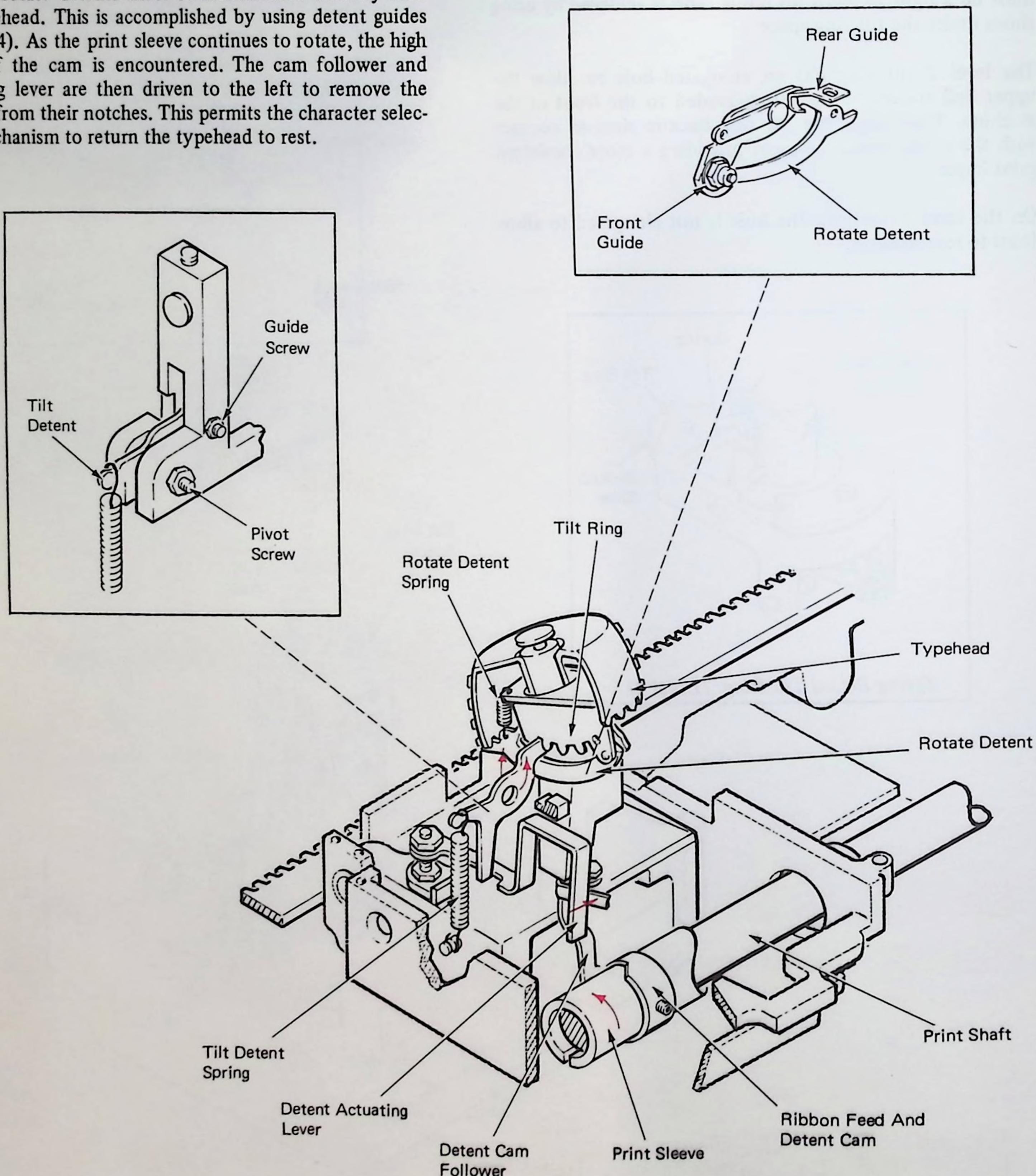


Figure 4 – Detent Operation

Vertical and horizontal alignment must be properly defined before any adjustments are attempted.

VERTICAL alignment problems exist when the letters are out of position this way. ↕ An example follows:

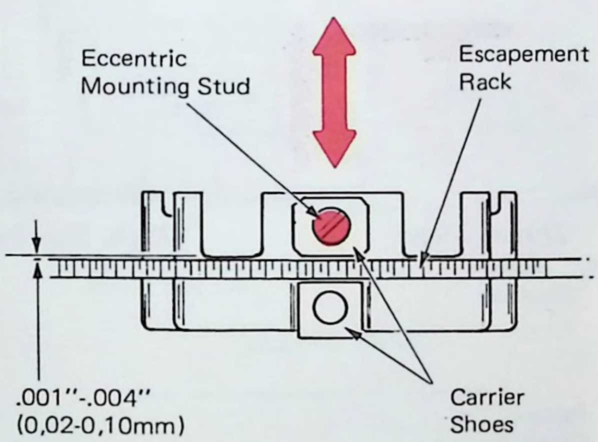
anbncndnenfngnhninjnknlnmnnnonpnqnrnsntnunvnwnxnynzn
ANBNCNDNENFNGNHNINJNKNLNMNNNONPNQNRNSNTNUNVNWNXNYNZN

HORIZONTAL alignment problems exist when the letters are out of position this way. ⟷ An example follows:

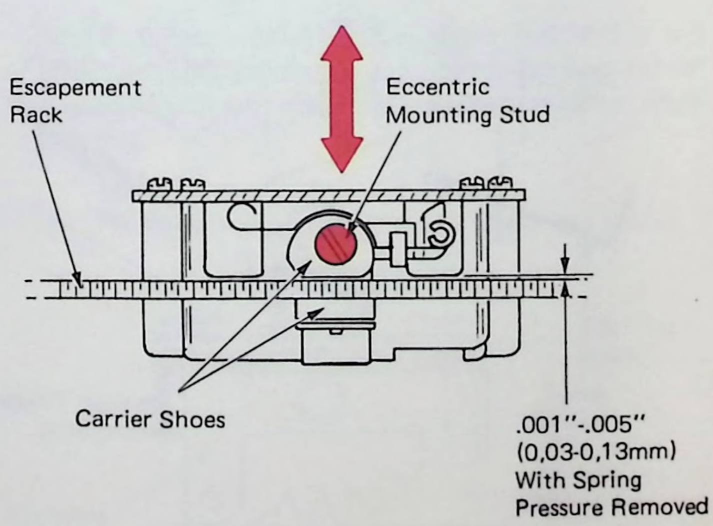
anbncndnenfngnhninjnknlnmnnnonpnqnrnsntnunvnwnxnynzn
ANBNCNDNENFNGNHNINJNKNLNMNNNONPNQNRNSNTNUNVNWNXNYNZN

FINE ALIGNMENT ADJUSTMENTS

1. *Carrier Shoe* – Adjust the level 1 carrier shoe eccentric mounting stud to obtain .001"-.004" vertical play between the carrier shoes and the escapement rack. The level 2 carriers equipped with the spring loaded carrier shoe should be adjusted for .001"-.005" of vertical movement with the spring pressure removed. This adjustment should be checked at several points along the escapement rack.



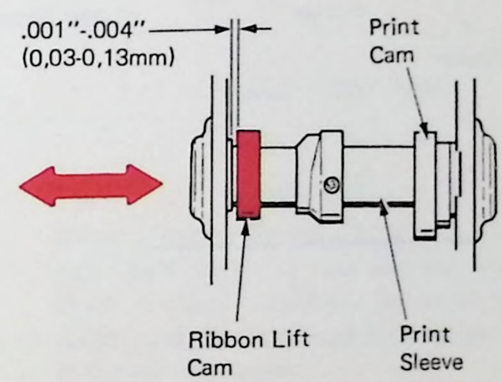
(Level 1 – Rear View)



(Level 2 – Rear View)

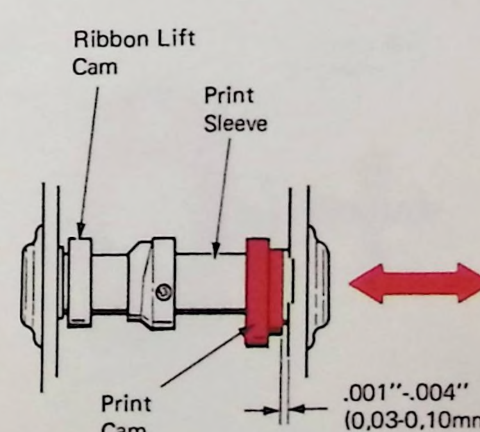
2. *Print Sleeve End Play* – The print sleeve must have .001"-.004" side play.

Level 1 – The adjustment is obtained by adjusting the ribbon lift cam left to right. The print cam set screw should first be tightened into the dimple in the print sleeve.



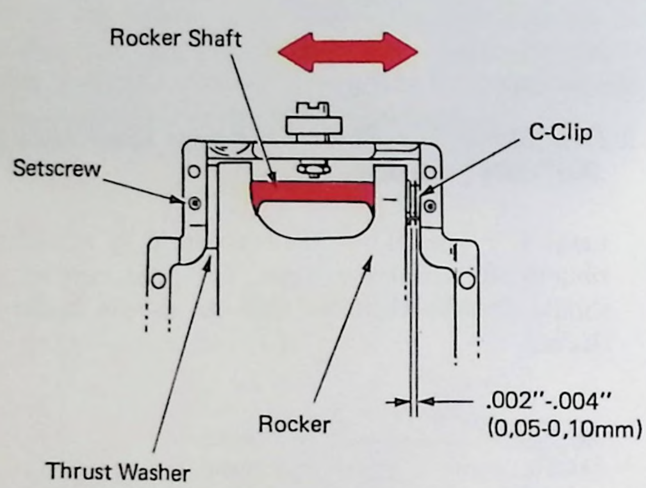
(Top View – Level 1)

Level 2 – The set screw in the ribbon lift cam should first be tightened into the dimple and the print cam adjusted left to right to obtain the print sleeve end play.



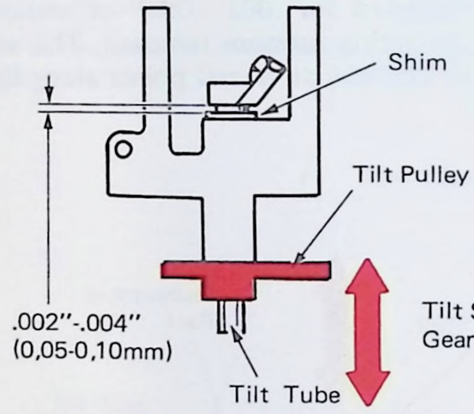
(Top View)

3. *Rocker End Play* – Adjust the rocker shaft to obtain .002"-.004" side play. The side play exists between a C-clip around the shaft at the right of the rocker and a thrust washer against the carrier casting at the left of the rocker. The rocker shaft is held in place by a setscrew at the left end of the rocker shaft in the carrier casting. This adjustment should be kept to the minimum side of the specification.

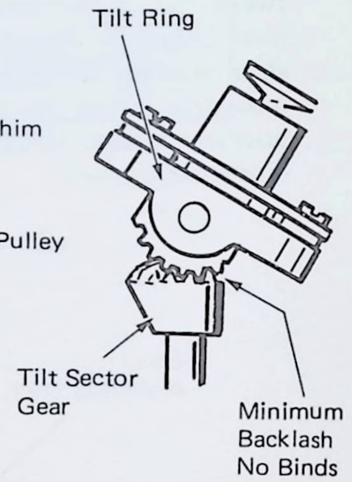


(Top View)

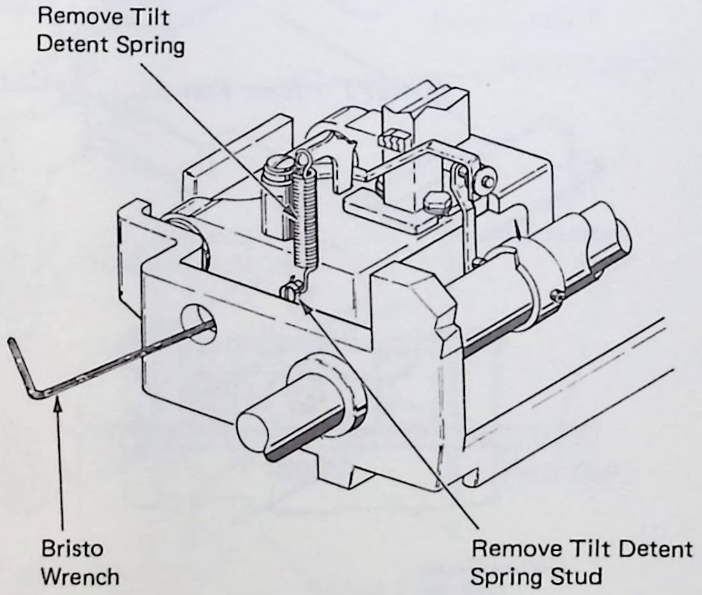
4. *Tilt Tube Endplay (Machines Prior To Gearless Tilt)* – Adjust the tilt pulley vertically on the tilt tube to obtain .002"-.004" endplay. The tilt pulley is attached to the tilt tube by a setscrew and a key against a flat surface on the tilt tube. The setscrew is accessible through a hole in the left side of the carrier. Move the carrier to the right and remove the tilt pulley spring and the tilt detent spring. The tilt detent spring stud can then be removed through the hole in the carrier. The holes in the carrier and rocker will make the tilt pulley setscrew accessible with the bristo wrench. The height of the tilt sector gear is established by shimming between the gear and the top of the yoke. This height is set to obtain minimum backlash with no binds between the tilt sector gear and the tilt ring gear.



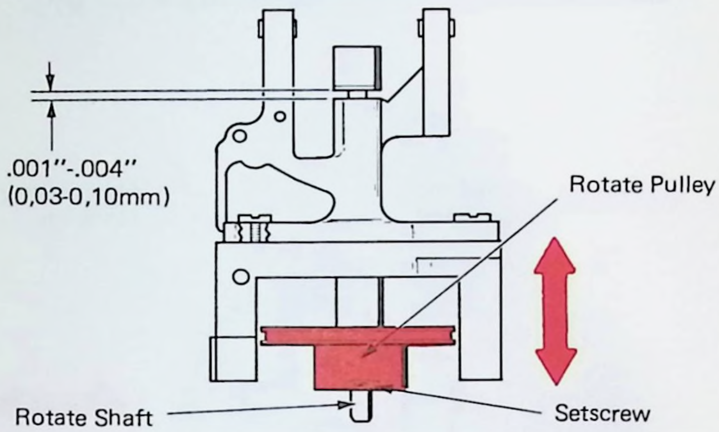
(Front View)



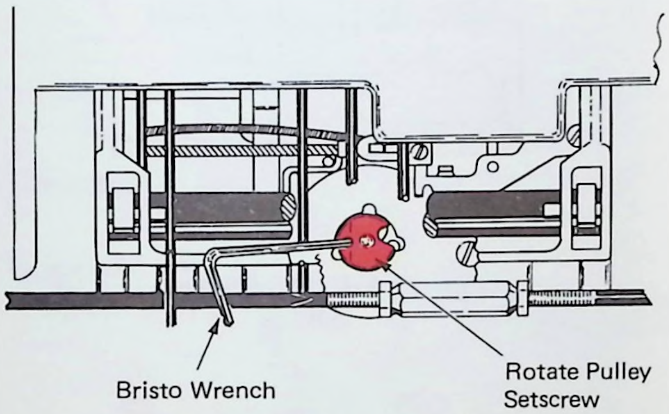
(Right Side View)



5. *Rotate Shaft End Play* – Adjust the rotate pulley vertically to obtain .001"-.004" vertical motion of the rotate shaft. The rotate pulley is secured to the rotate shaft by a wedging block and a setscrew. The pulley is accessible from the bottom of the machine with the carrier centered over the cycle shaft and the machine in upper case. DO NOT rotate the rotate shaft when the pulley is loose as this affects homing. Recheck typehead homing after making this adjustment.



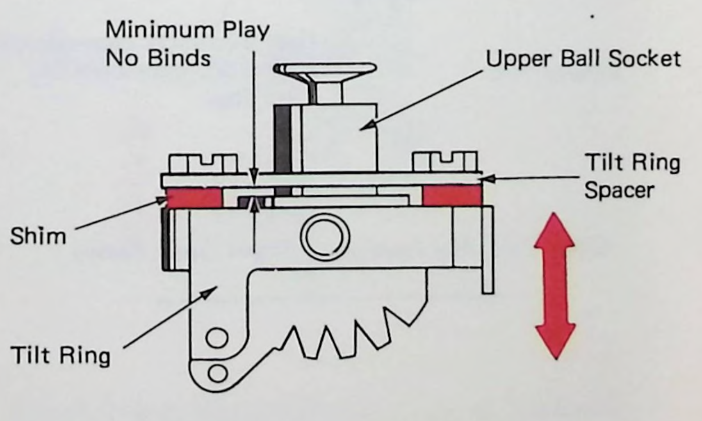
(Front View)



(Bottom View)

6. *Upper Ball Socket*
(a) Shim the tilt ring spacer so there is no vertical play in the upper ball socket but it is still free to rotate.

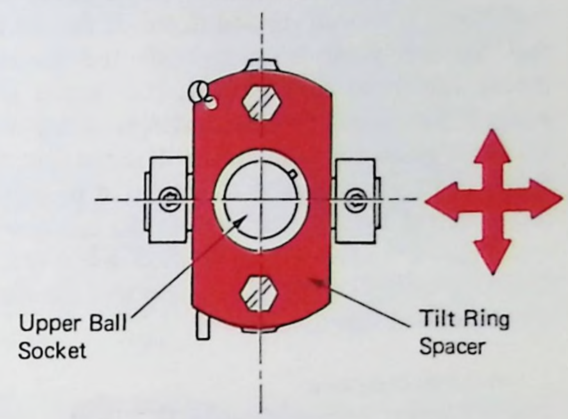
NOTE: Vertical play in the upper ball socket will affect vertical alignment and impression because the typehead will not maintain a definite position when printing.



(Right Side View)

(b) Level 1 – Position the tilt ring spacer front to rear and left to right so that the upper ball socket is centered in the tilt ring spacer.

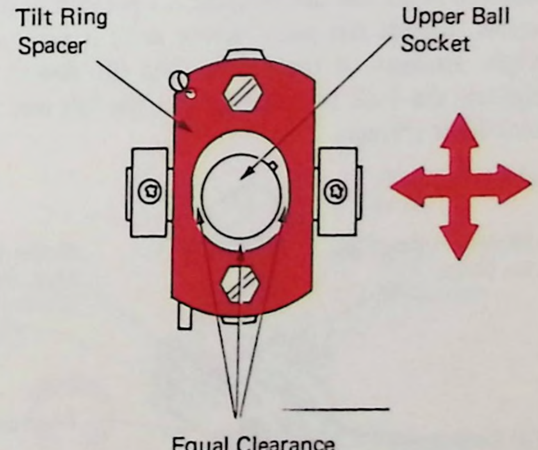
NOTE: A bind in the upper ball socket can result in poor horizontal alignment if the rotate detent fails to seat in the detent notch before print occurs. A bind can also cause the nylon roller to drop, on compensator equipped machines, during a negative selection. Binds in the carrier area can be detected by manually operating the shift arm in and out with the typehead installed.



(Level 1 – Top View)

Level 2 Spring Biased Tilt Ring – Position the tilt ring spacer front to rear and left to right so that there is equal clearance between the upper ball socket and the front and both sides of the opening in the tilt ring spacer.

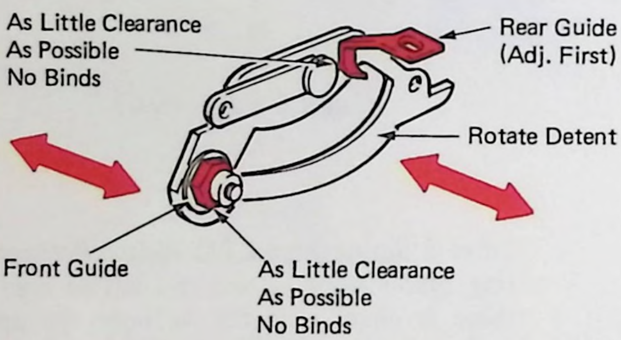
NOTE: To prevent malselection, all type elements used with this tilt ring must be lubricated with a light film of No. 23 Grease on the inner surface.



(Level 2 – Top View)

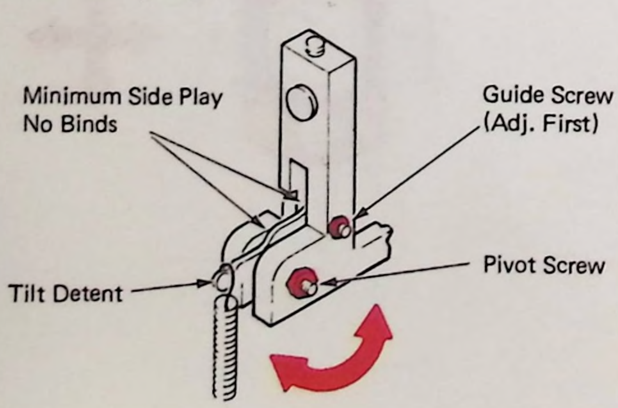
7. *Rotate Detent* – Adjust the front and rear rotate detent guides so the detent will operate vertically with no binds, but has no horizontal movement. This adjustment should be checked by half cycling a 3 tilt 0 rotate character and checking for rotational movement of the typehead. Excessive play in the rotate detent will cause poor horizontal alignment because the detent will not positively position the typehead.

This adjustment can best be made with the tilt ring off of the machine. Loosen the front guide nut approximately a half turn to assure that it will not interfere while adjusting the rear guide. Remove the rotate detent spring and adjust the rear rotate detent guide until a very slight amount of friction exists as the rear tip of the detent is moved up and down. It should be noted that the rear guide is on an angle and the closer the detent travels to the tilt ring, the tighter it will be wedged. Reconnect the rotate detent spring and adjust the front guide adjusting nut until it restricts the rotate detent from being pulled to its seated position by the rotate detent spring, then loosen the nut until the detent snaps into place. This method will give minimum clearance with no binds. If you removed the tilt ring, do not reinstall at this time.



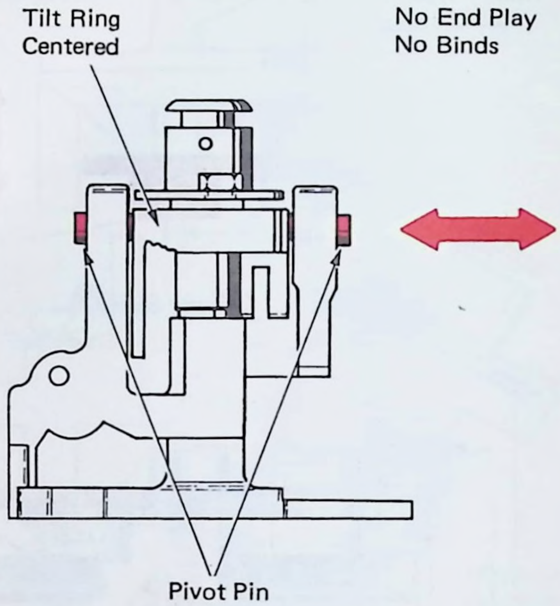
8. *Tilt Detent* – The tilt detent should pivot freely about its pivot screw but have no side play. This can best be achieved by loosening both the pivot screw and the guide screw and disconnecting the tilt spring. If you did not have to remove the tilt ring to perform the rotate detent adjustment, disconnect the rotate detent spring.

Adjust the guide screw so that no side movement is allowed when the detent lever is operated past the guide screw. Adjust the pivot screw until it produces a very slight amount of friction on the tilt detent lever and tighten the lock nut. Reconnect the tilt and rotate detent lever springs.

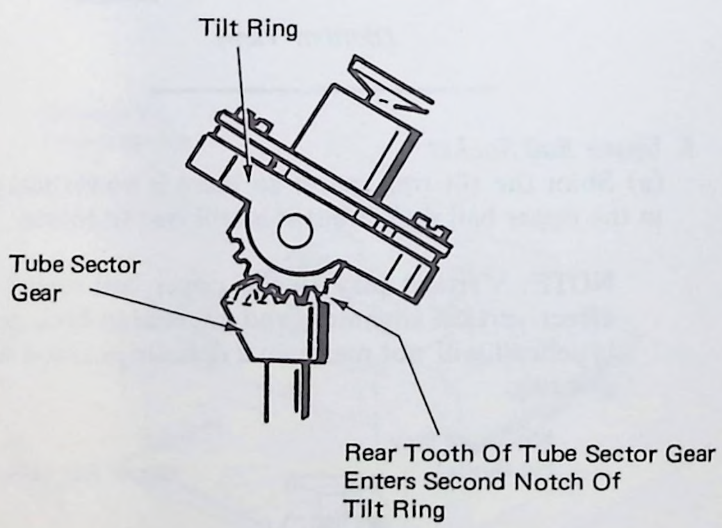


9. *Tilt Ring* – The tilt ring should be centered in the yoke with no side play. Adjust the pivot pins to satisfy this condition. Once installed there should be absolutely no side play to the tilt ring.

NOTE: On machines prior to the gearless tilt mechanism, care should be taken to ensure that the tilt sector gears are properly matched whenever the tilt ring is installed. The rear tooth of the tube sector gear should enter the second notch of the tilt ring sector gear.

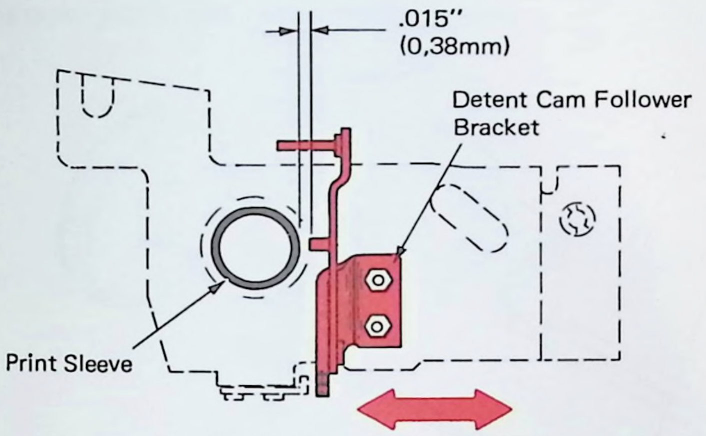


Gearless Tilt Mechanism

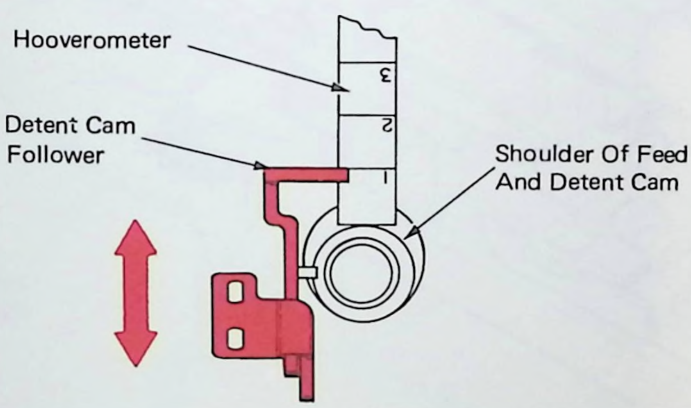


Gear Tilt Mechanism (Right Side View)

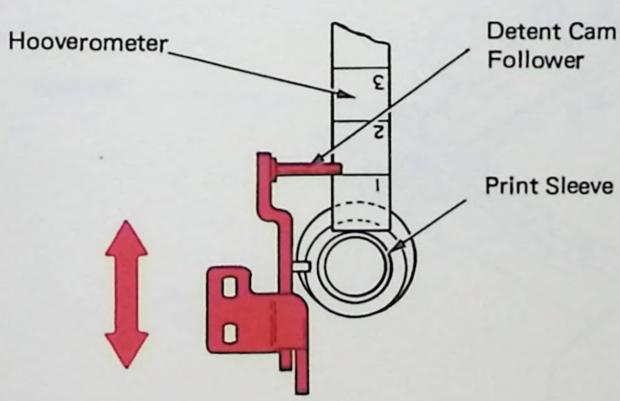
10. *Detent Cam Follower* – The detent cam follower mounting bracket should be adjusted to satisfy the following conditions: (a) Front to rear for a clearance of .015" between the print sleeve and the end of the pin on the cam follower. (b) Vertically so the top of the cam follower is in line with the Number 1 scribe line on the Hooverometer with the Hooverometer resting on the print sleeve. Machines equipped with a roller on the detent cam follower should be positioned so the bottom surface of the pin is in line with the Number 1 scribe line.



Front To Rear Adjustment
(Right Side View)

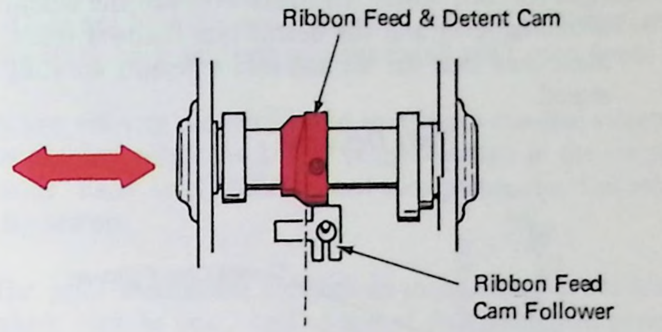


Rollerless Detent Cam Follower
Vertical Adjustment



Roller Detent Cam Follower (Left Side View)

11. *Detent Skirt Clearance (Machines Prior To Gearless Tilt)* – The detent mechanism must be adjusted to satisfy the following conditions: (a) Position the ribbon feed and detent cam left to right on the print sleeve so that the inside rib of the cam will be in line with the left hand edge of the ribbon feed cam follower.



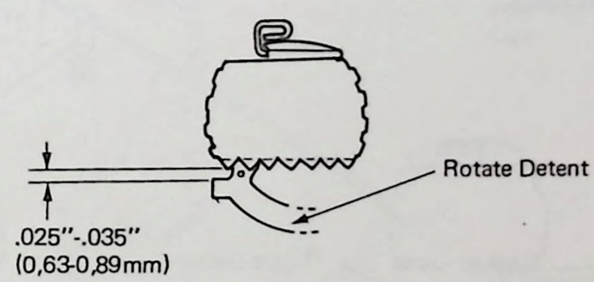
(Top View)

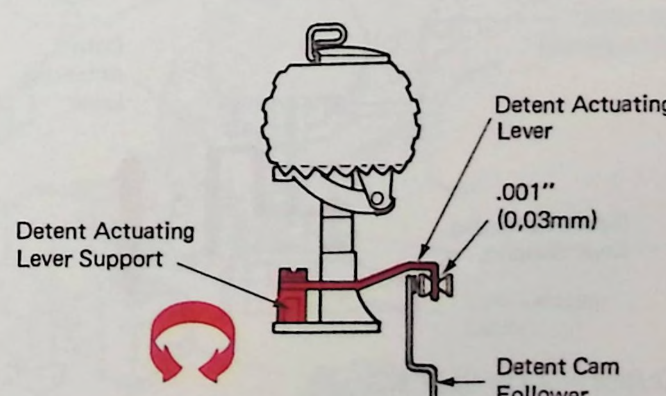
(b) Adjust the detent actuating lever support front-to-rear so the rotate detent will clear the teeth on the typehead skirt by .025"-.035" when the cycle shaft is at rest. This clearance should be observed when the typehead is manually rotated to the tilt two position.

(c) With the detent cam follower on the low dwell of the detent cam, rotate the actuating lever support until .001" clearance is felt between the detent actuating lever and the detent cam follower roller.

NOTE: The above adjustments of the detent mechanism directly affect each other and must be adjusted alternately to obtain the correct clearances.

At Rest – 2 Tilt Oper. Manually



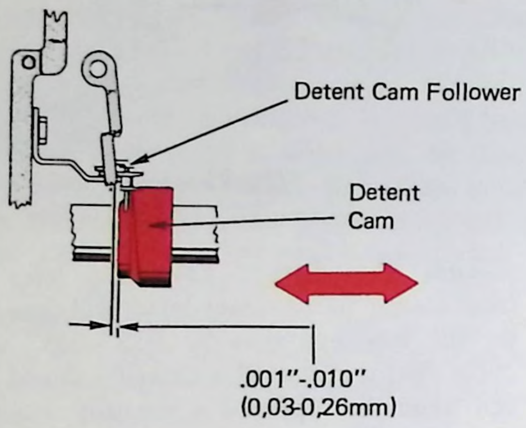


Half Cycled (Left Side View)

12. *Detent Skirt Clearance (Gearless Tilt)* – To obtain detent clearance, adjust the detent cam and the detent actuating lever to satisfy the following conditions:

(a) With the detent cam follower on the low dwell of the cam, adjust the ribbon feed/detent cam left or right for .001"-.010" clearance between the detent actuating lever and the detent cam follower roller. Make sure that the tilt and rotate detents are fully seated.

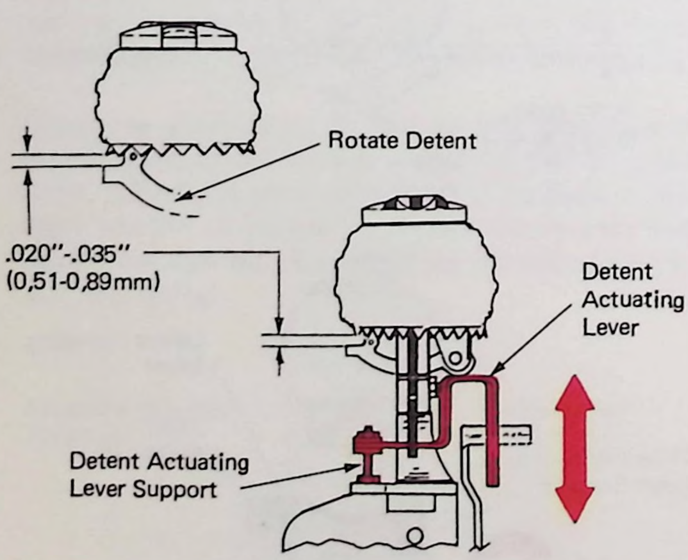
Fully Detented



(Top View – Half-Cycled)

(b) With the cycle shaft at rest and the typehead manually held at the tilt two position, adjust the detent actuating lever support screw up or down for .020"-.035" clearance between the rotate detent and the tip of the teeth on the typehead skirt.

NOTE: These two adjustments may affect each other and should be adjusted alternately to obtain the correct clearances.



At Rest – 2 Tilt Oper. Manually

(Left Side View)

The purpose of the print mechanism is to power the typehead toward the platen. This is accomplished through a print cam located in the carrier assembly (Figure 1). When the printer is cycled for a character selection/print operation, motion is transferred by the print shaft through the print cam, a cam follower, and the rocker assembly to power the typehead toward the platen.

There are two basic conditions necessary for a correct print operation. They are: Correct velocity of the typehead as it strikes the paper, and proper platen position.

Two levels of velocity may be selected on machines having the dual velocity feature. Alpha-Numeric characters receive the highest velocity while smaller characters such as punctuation and symbols receive a lower velocity. Some models of I/O do not have the device to select different velocities, and therefore, have only one velocity for all print operations.

A low velocity magnet is used to activate the dual velocity mechanism when the I/O is being operated in the output mode. Early level I/O's did not incorporate the dual velocity feature.

The print mechanism contains an impression control lever which may be positioned to one of five settings to permit the operator to change the overall velocity of the typehead (Figure 1).

A copy control mechanism allows the operator to position the platen front to rear to accomodate different thicknesses of typing material.

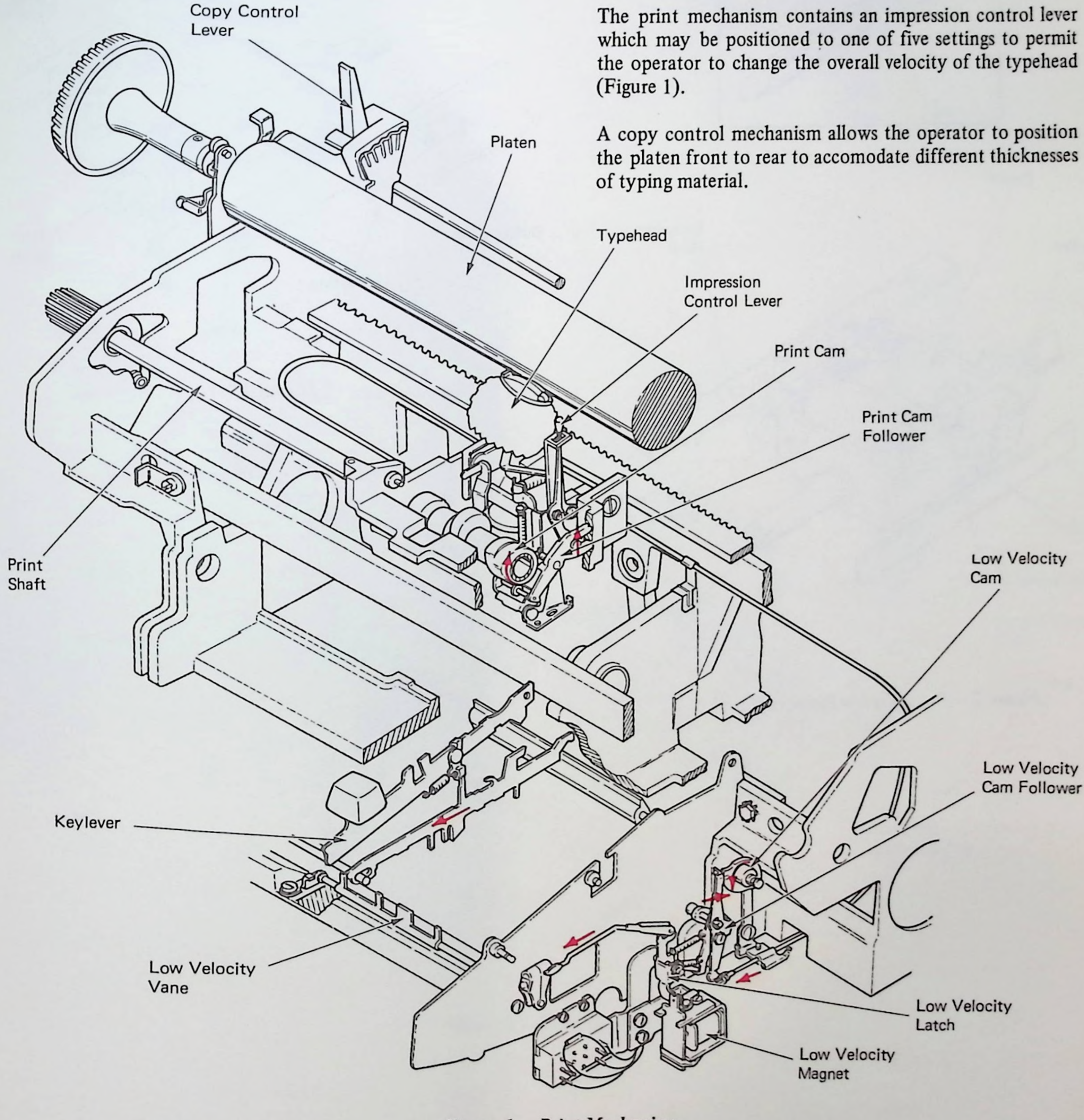


Figure 1 – Print Mechanism

FRONT CARRIER SUPPORT

The typehead is supported in front of the paper by a frame called the carrier (Figure 2). Its purpose is to transport the typehead and related mechanism along the writing line. The carrier assembly is supported in front by the print shaft and a print sleeve. The print sleeve is keyed to the print shaft and therefore turns whenever the print shaft is rotated. Motion for a print operation is taken off the print sleeve.

Due to print shaft flex, the front of the carrier needs additional support. An anvil is located under the front of the carrier (Figure 2). On level two machines, a carrier pad contacts this anvil when flexing of the print shaft occurs. On level one machines a buffer screw and a buffer plate serve the same function. (Rear carrier support is covered in the Fine Alignment Section of this manual.)

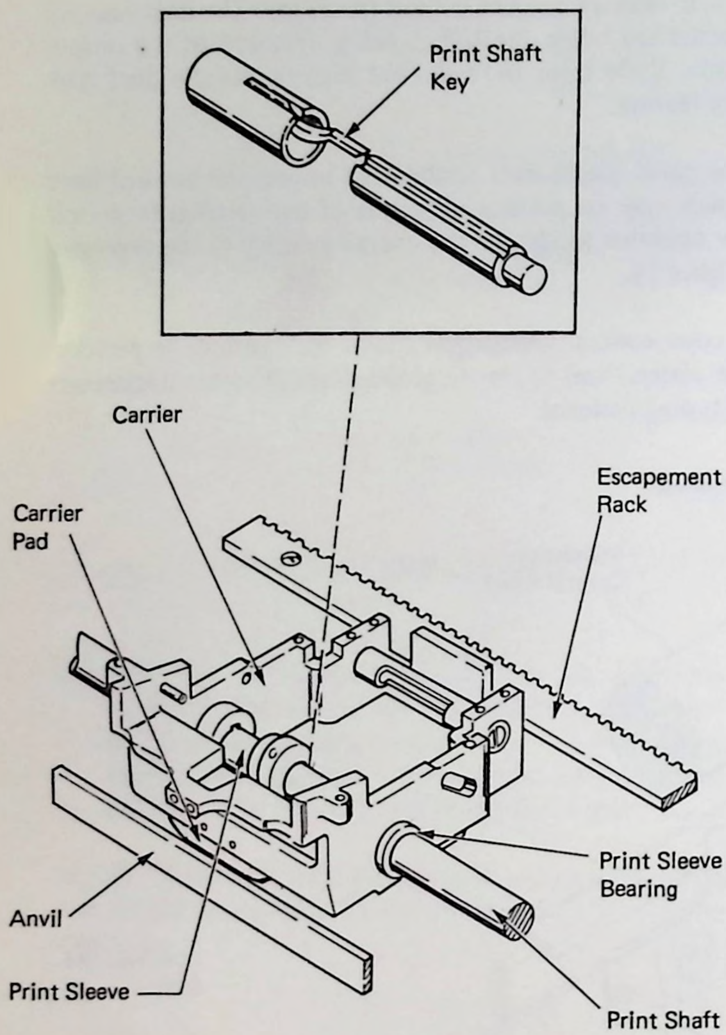
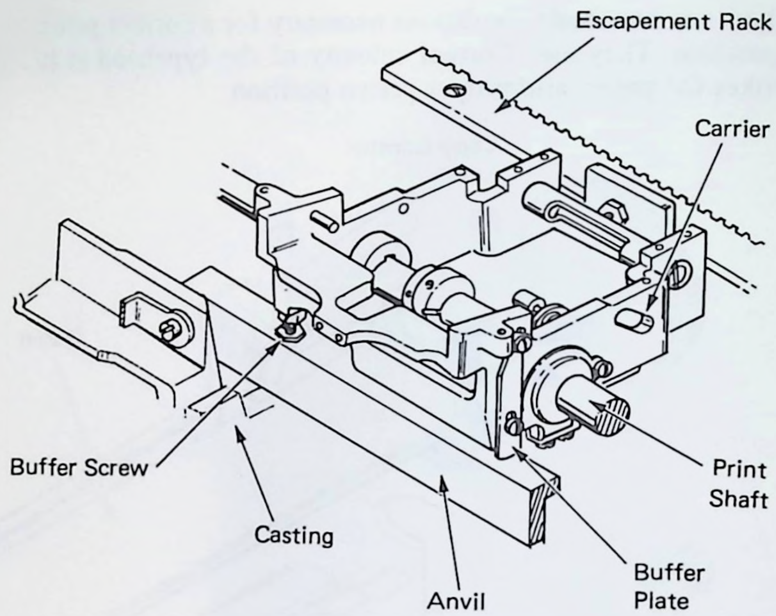


Figure 2 – Front Carrier Support (Level 2)



(Level 1)

PRINT OPERATION

Drive to operate the print cam mechanism is supplied through the print shaft (Figure 3). The print shaft extends the width of the printer and is supported in a bearing at each end. A gear at the left end of the print shaft meshes with an idler gear of the character selection mechanism. When the character selection mechanism is cycled, motion is transferred through the idler gear and the print shaft-gear to rotate the print shaft top to rear. The print shaft is rotated 360° each cycle.

The print cam is setscrewed to the print sleeve which in turn is keyed to the print shaft. The key connection between the print shaft and the print sleeve is discussed in the Fine Alignment section of this manual.

When the print shaft is rotated, motion is transferred through the print sleeve to rotate the print cam. Print cam motion is then transferred through the cam follower and the impression control lever to pivot the rocker assembly about the rocker shaft and power the typehead toward the platen.

On Level 2 print mechanisms, the velocity cam follower roller may be positioned opposite either lobe of the print cam. On machines without dual velocity, the print cam follower roller will always be positioned opposite the high velocity lobe.

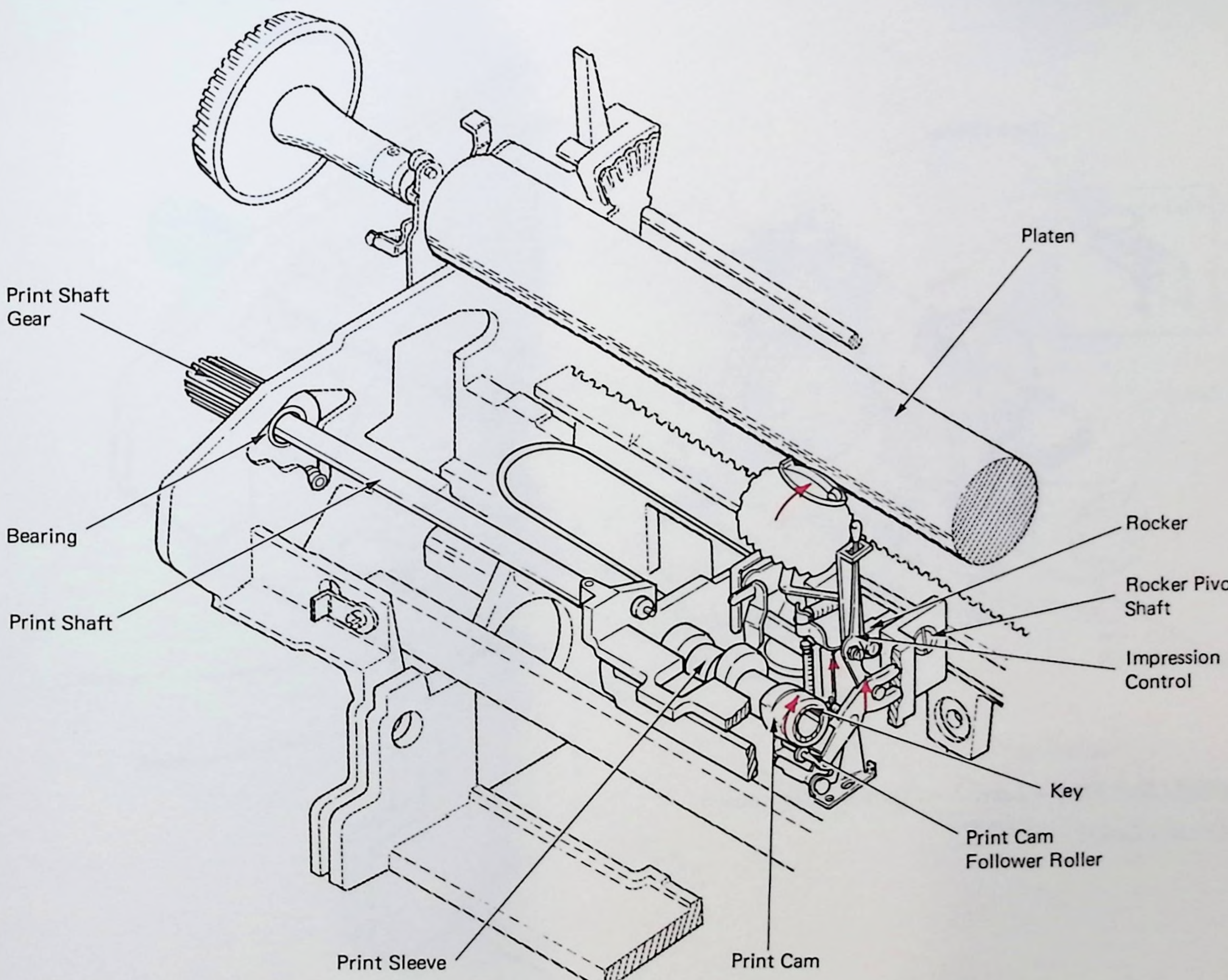
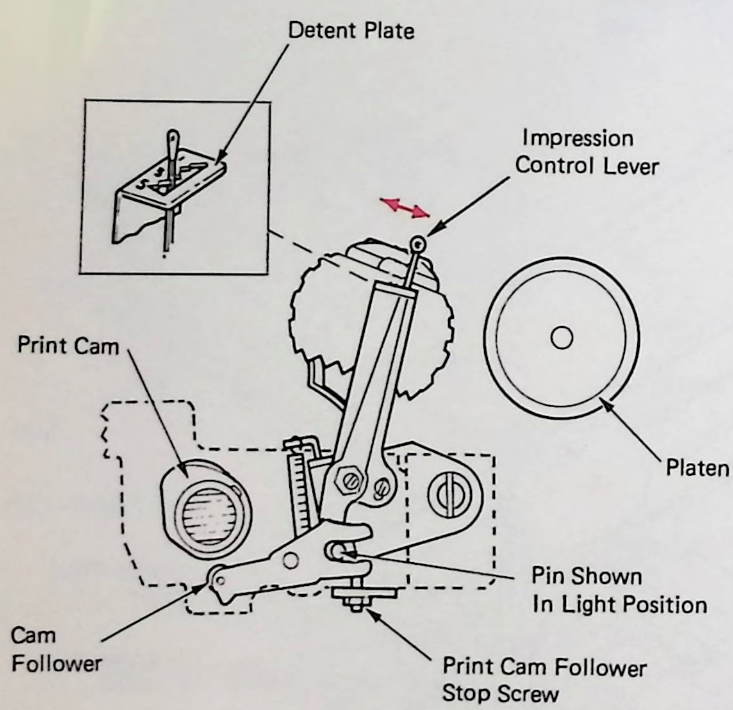


Figure 3 – Print Operation

IMPRESSION CONTROL LEVER (LEVEL 2)
The impression made by the typehead is determined by the velocity of the typehead upon impact with the paper. By increasing or decreasing the velocity of the typehead with the impression control lever, the impression for all characters can be changed equally.

The impression control lever may be positioned by the operator to one of five different impression settings (Figure 4). Changing the position of the impression control lever causes a pin in the lower part of the lever to move to the front or to the rear of the print cam follower arm. The front to rear position of the pin determines the amount of powered travel the typehead receives from the print cam follower. This, plus the amount of free flight, determines the velocity of the typehead upon impact with the paper.

Powered flight is the distance the typehead is driven by the print cam. Free flight is the amount of typehead movement from the high point of the print cam to the platen.



(Right Side View – Level 2 – Figure 4 – Impression Control Lever)

PRINT MECHANISM (LEVEL 1)

Level 1 machines did not have the automatic velocity control mechanism. The impression was a preset adjustment and could not be changed by the operator (Figure 5).

The print cam is a double cam. Its function is to power the typehead toward the platen and restore it to rest. A small camming surface on the right is the print cam and moves the typehead toward the platen. A larger camming surface on the left is called the restoring cam. It restores the typehead to rest and prevents it from rebounding.

The camming surface of the print cam is designed so the typehead is powered within a few thousandths of an inch of the platen. Because the typehead is powered nearly all the way to the platen, all the characters are forced to emboss the paper slightly, even those with a large surface area. To restrict the amount of free flight of the typehead so embossing will be the same for all characters, a heavy arm called the anvil striker is attached to the bottom of the carrier and acts as a stop for the rocker. Just under the front of the carrier and extending between the side frames is an anvil. It is an angle-shaped bar with the lip extending to the rear. As the typehead embosses the paper to the correct depth, the striker hits the bottom of the anvil and prevents further travel of the rocker and typehead. This means that the impression for each character will be consistent with little variation between characters.

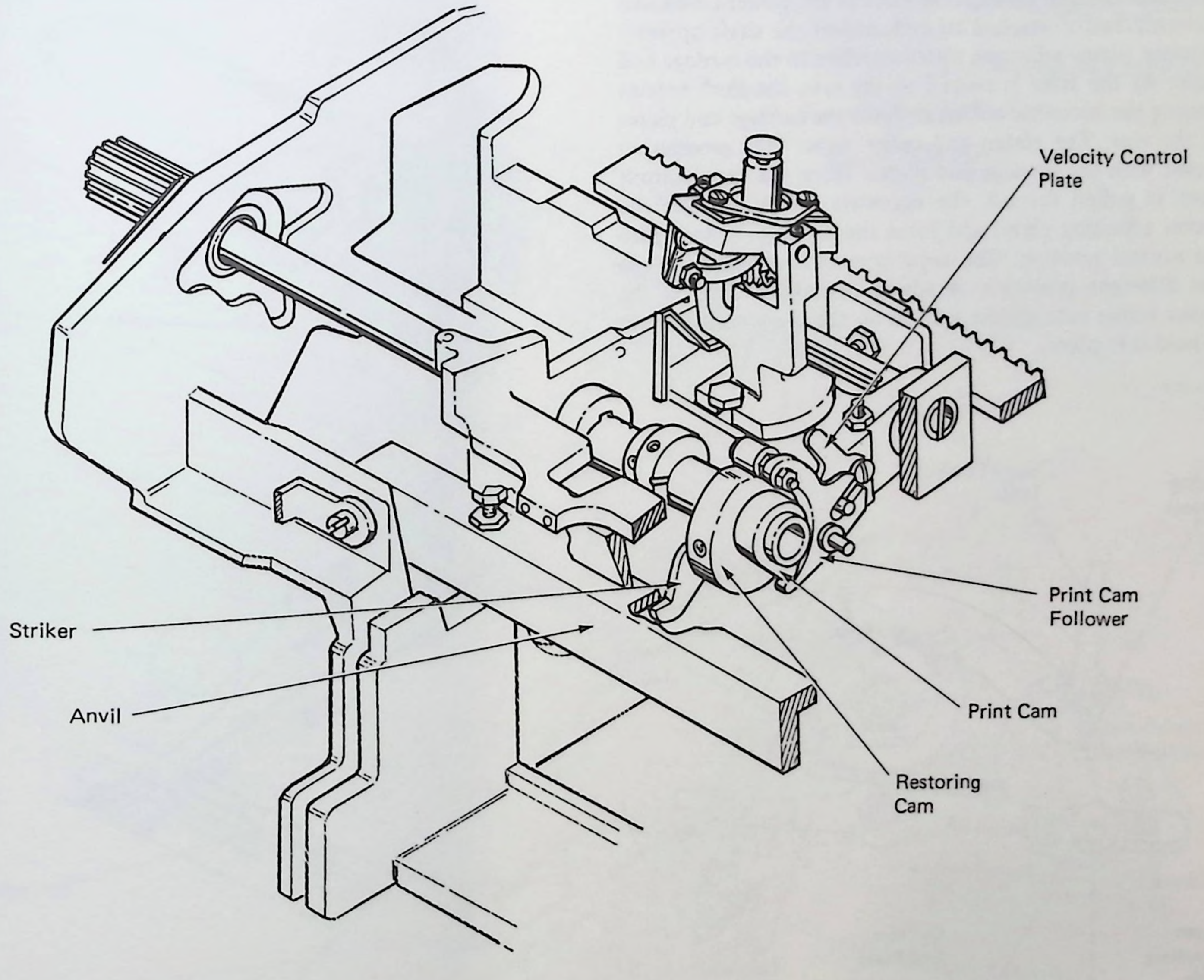


Figure 5 – Print Mechanism (Level 1)

PLATEN

The quality of typed impression is determined to a large extent by the condition of the platen. Platen rubber may be adversely affected by numerous factors such as light, heat, chemicals, etc. An old or worn platen may also vary slightly in diameter.

The platen is supported by the carriage guide brackets and held in position by the platen latches (Figure 6).

The platen may be removed by pressing the rear of the latches down and lifting the platen out. It may be reinstalled by snapping it into position without depressing the latches; however, care must be taken to prevent bending the platen shaft. Also, releasing the feedroll tension will aid in the re-installation of the platen.

COPY CONTROL LEVER

The copy control mechanism positions the platen front to rear for different thicknesses of typing material. The copy control mechanism is operated by a lever located at the left end of the carriage (Figure 6). The lever is attached to a shaft that extends through the sides of the power frame. An eccentric collar attached to each end of the shaft operates between platen adjusting plates attached to the carriage end plate. As the lever is moved to the rear, the shaft rotates causing the eccentric collars to force the carriage end plates to the rear. The platen and entire paper feed mechanism moves with the carriage end plates. When the copy control lever is pulled foward, the eccentric collars contact the platen adjusting plates and force the carriage forward into the normal position. The copy control lever can be set in five different positions. A spring detent attached to the power frame acts against a knob on the copy control lever to hold it in place.

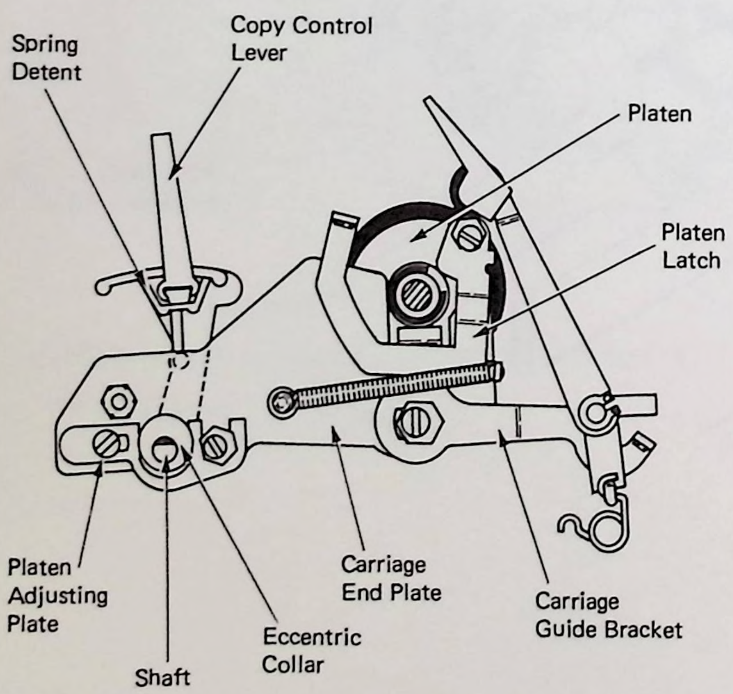
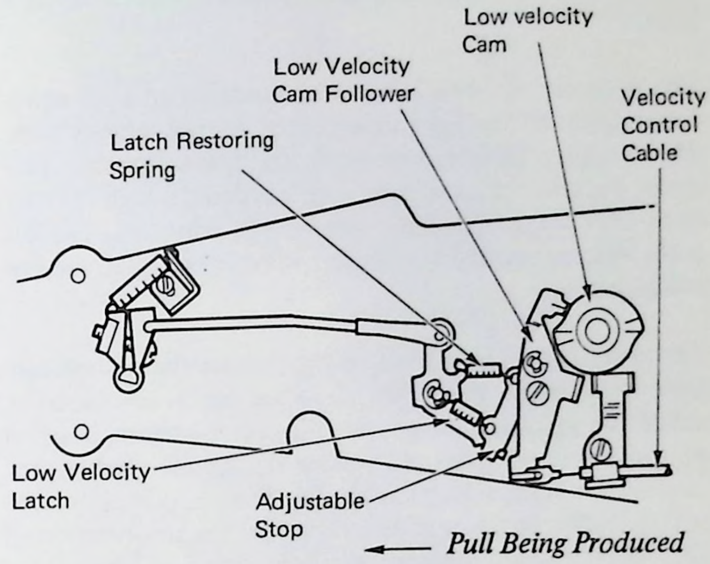


Figure 6 – Platen & Copy Control Lever (Left Side View)

DUAL VELOCITY SELECTION

On I/O's with dual velocity, when a low velocity character is selected, a pull on the velocity control cable is produced to shift the roller to the low velocity lobe on the print cam (Figure 7). A low velocity vane is mounted in the keyboard in a position to be contacted by the selector interposer as it is driven forward by the filter shaft. Attached to the right end of the low velocity vane is the low velocity vane bellcrank. Rotation of the vane and bellcrank creates a pull on the link causing the low velocity latch to rotate counterclockwise about its mounting stud. As the latch rotates, it pivots out of the operating path of the adjustable stop attached to the low velocity cam follower. The low velocity cam follower is spring loaded against the low velocity cam. With the low velocity latch removed from its operating path, the cam follower will travel to the low dwell of the low velocity cam and create a pull on the velocity control cable.

If a high velocity character is selected at the keyboard, the low velocity latch will remain at rest in the operating path of the stop on the cam follower. The cam follower is restricted from following the contour of the cam and no pull is felt on the velocity control cable. The print cam follower roller remains to the right under the high velocity lobe of the print cam and a high velocity print operation results.



Low Velocity Operation

(Right Side View)

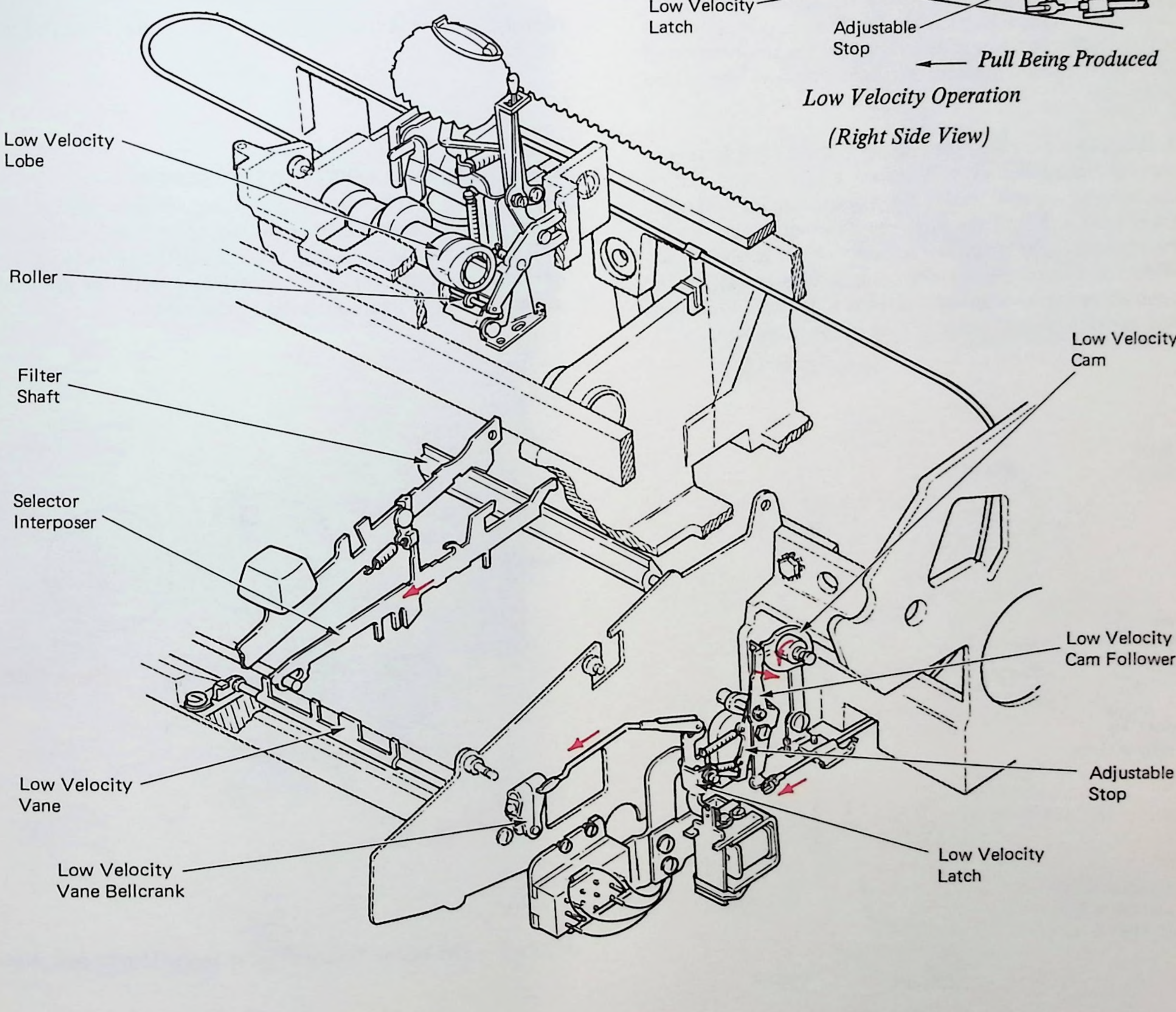


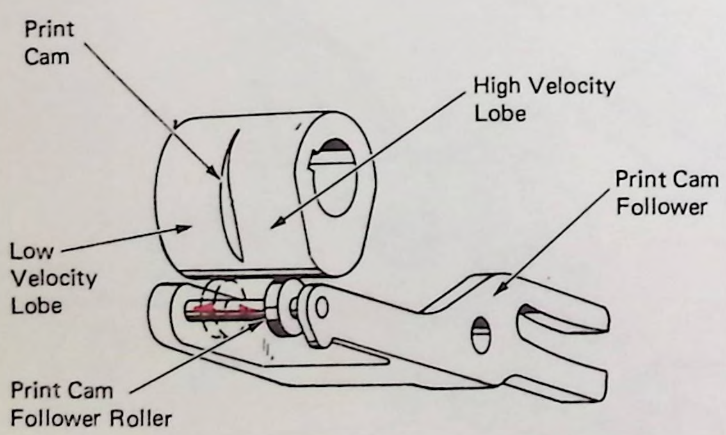
Figure 7 – Low Velocity Sequence

This is accomplished by using a print cam that has two different camming surfaces (Figure 8). The low and high points of both camming surfaces are identical. The only difference is in the contour between their low and high points. The contour of one camming surface has a more gradual rise and provides the typehead with a lower impact velocity than the other. The difference in typehead velocities produced by the two camming surfaces remains proportional between all settings of the impression control lever.

The print cam follower has a roller mounted on a pin and is free to slide left to right to select the desired velocity lobe. The camming surface or lobe on the print cam that produces the greatest impact velocity is called the high velocity lobe. This is the right hand lobe on the print cam. The left hand lobe, producing less impact velocity, is called the low velocity lobe.

The roller is positioned left to right under the desired cam lobe by a roller yoke that straddles the roller. A lever, called the yoke actuating lever, controls the lateral position of the yoke and roller. It mounts on the tab cord anchor bracket by a shouldered rivet. The yoke actuating lever is spring loaded at the rear and maintains the rest position of the roller directly beneath the high velocity lobe of the print cam.

A sheathed cable called the velocity control cable fastens to the yoke actuating lever. Whenever a pull is produced on the velocity control cable, the yoke actuating lever and roller yoke will shift the print cam follower roller from the high velocity lobe to the low velocity lobe of the print cam. When the pull on the velocity control cable is relaxed, the yoke actuating lever spring shifts the roller back to its position beneath the high velocity lobe of the print cam.



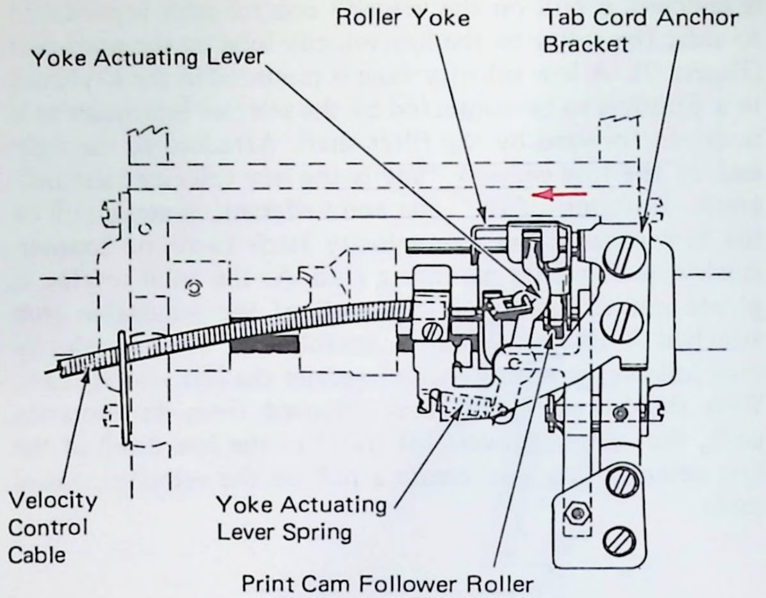


Figure 8 – Yoke Actuating Lever And Spring (Bottom View)

PRINT CAM FOLLOWER STOP SCREW

On the Level 2 print mechanism the print cam follower and roller are held disengaged from the print cam by an adjustable stop screw until the roller has shifted (Figure 9). This prevents the print cam from interfering with the print cam roller as it shifts from one lobe to the other.

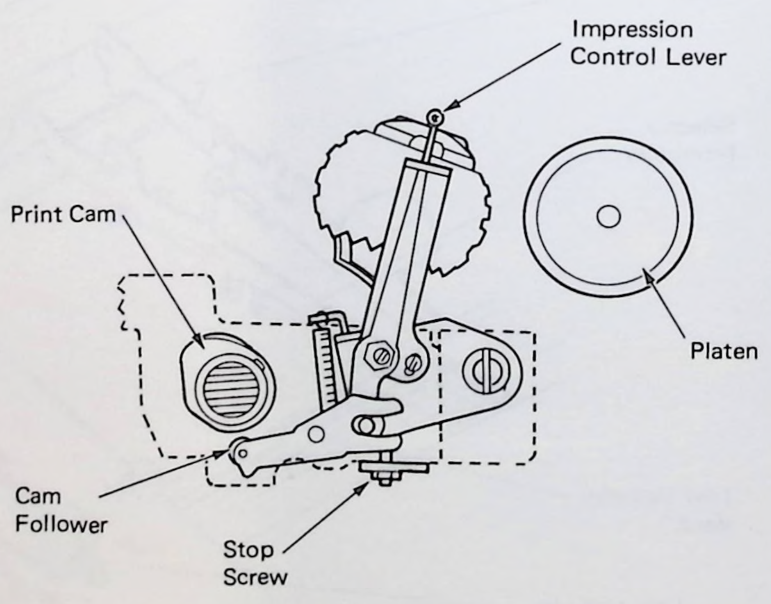
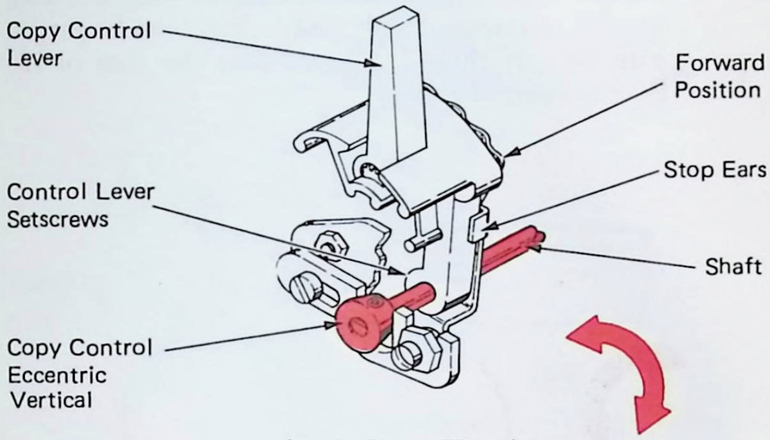


Figure 9 – Print Cam Follower Stop Screw (Right Side View)

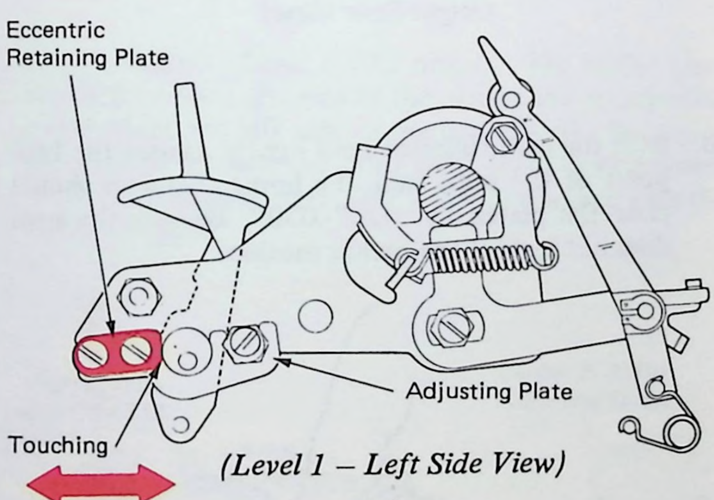
PRINT OPERATIONAL CONTROL ADJUSTMENTS

1. *Copy Control Lever Shaft* – With the copy control lever detented in the forward position, the high point of the eccentric should be up. Loosen the control lever setscrews and rotate the shaft to satisfy this condition. The stop ears on the copy control detent spring should be formed to provide positive detenting in the extreme front and rear positions of the lever.

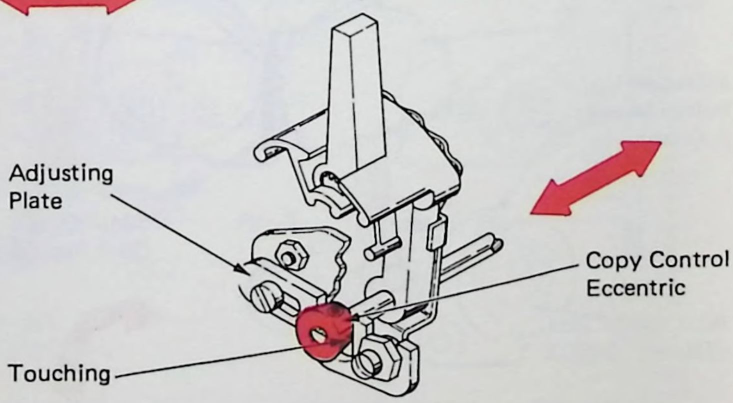


(Left Front View)

2. *Platen Adjusting Plates* – Adjust the eccentric retaining plates front to rear on level 1 machines or the copy control eccentric left to right on level 2 machines so there is no front to rear motion and no binds exist between the eccentric and the platen adjusting plates on each side of the machine.

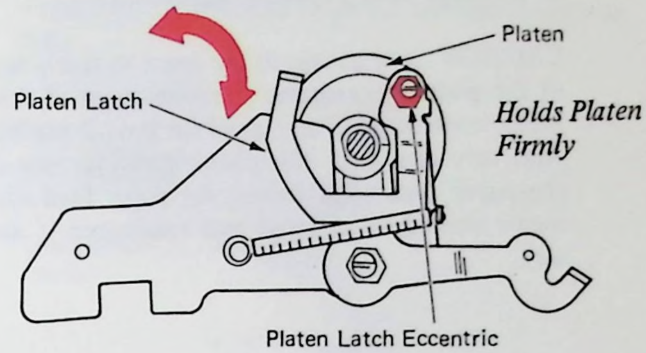


(Level 1 – Left Side View)



(Level 2 – Left Front View)

3. *Platen Latches* – Adjust the platen latch eccentrics, with the high part up, so the platen is held firmly in position vertically and horizontally. The latches should latch and unlatch freely with the feed rolls released.

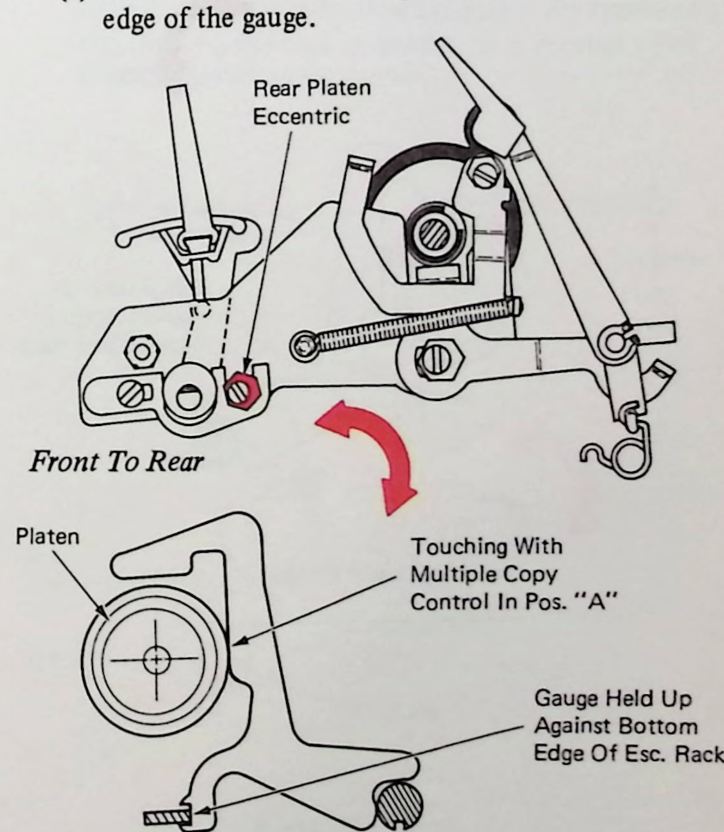


(Left Side View)

4. *Platen Position* – To properly adjust the print mechanism, the correct position of the platen must be established first and then the print adjustments made relative to the platen position. With the copy control lever forward and the print shaft keyway down, loosen the platen eccentrics on both ends and rotate to move the platen to the extreme rear and as low as possible.

Position the platen gauge on the print shaft and contacting the bottom of the escapement rack at one extreme end of the machine. Adjust the platen to meet the following conditions:

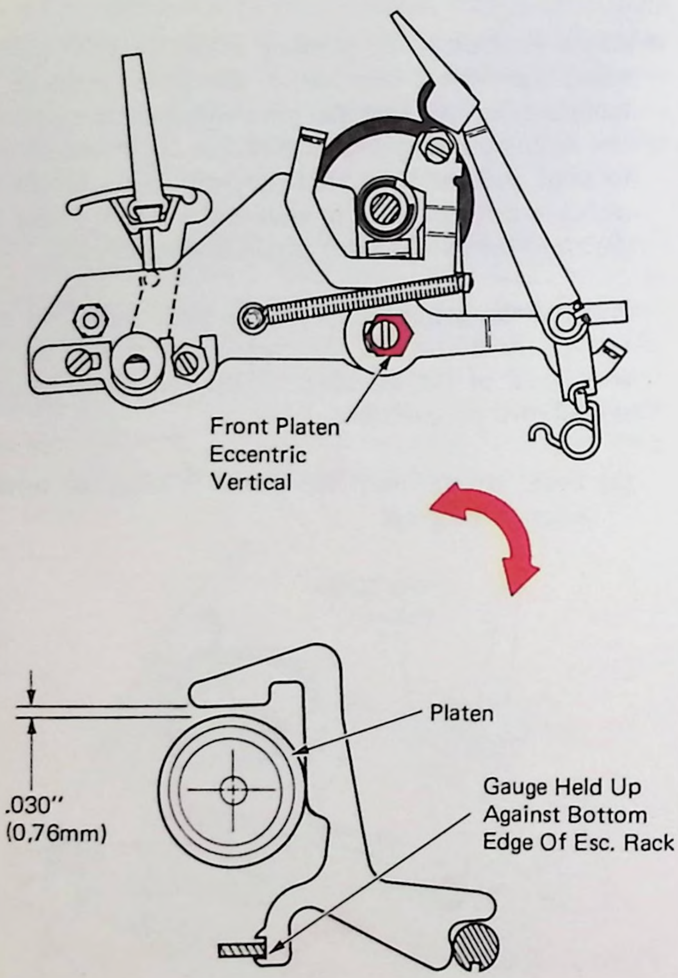
(a) Front to rear until the platen touches the vertical edge of the gauge.



(Left Side View)

(b) Vertically for .030" clearance between the top of the platen and the horizontal edge of the gauge. Move the gauge to the opposite end of the machine and repeat the procedure. Check for a parallel condition by sliding the gauge back to the beginning end. With the gauge removed, the platen height adjustment should now be refined to provide even top and bottom color of printed characters.

CAUTION: Any change in the front to rear position of the platen necessitates a readjustment of the velocity control plate and anvil on level 2 machines. Also, any change in the platen position may alter the paper feed adjustments. All paper feed adjustments should be checked and readjusted if necessary.



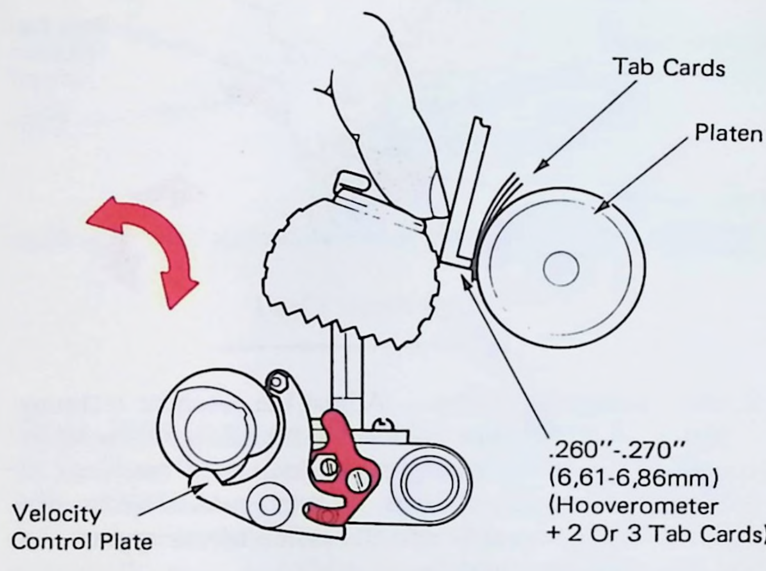
(Left Side View)

ADJUSTMENTS 5 THROUGH 8 ARE FOR LEVEL 1 MACHINES ONLY.

5. *Velocity Control Plate (Level 1)* – The velocity control plate must be adjusted to satisfy the following two conditions.

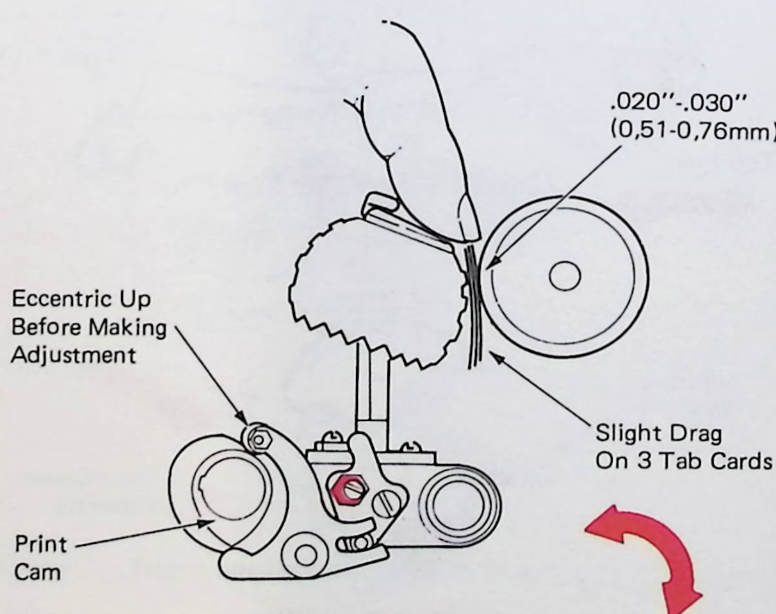
a. With the cam follower held lightly against the low point of the print cam, the center of the home character should clear the platen by .260"-.270".

NOTE: The adjustments should be checked with the ribbon removed. The .260"-.270" can be gauged with two or three tab cards plus the foot of the Hooverometer handle.



(Right Side View)

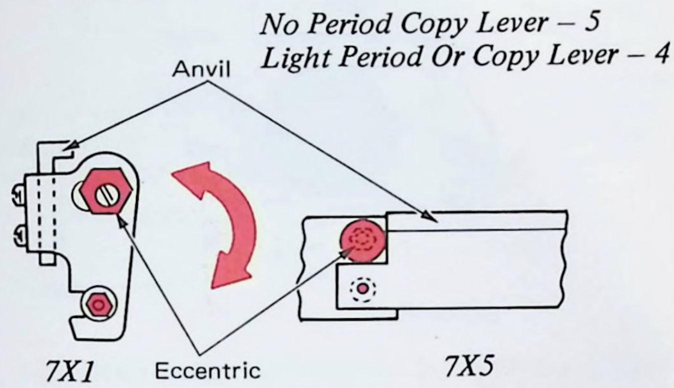
b. With the cam follower held lightly against the high point of the print cam, the home character should clear the platen by .020"-.030". Be sure the anvil does not restrict the rocker motion.



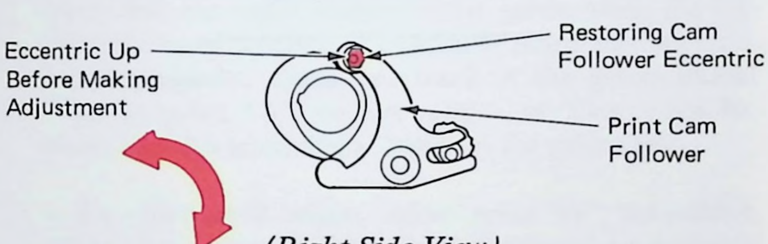
(Right Side View)

6. *Anvil (Level 1)* – Adjust the eccentric at each end of the anvil to properly restrict the free flight of the typehead. With one sheet of paper installed in the machine, the period should just fail to print with the copy lever all the way back. With the copy lever pulled forward one notch (fourth position), the period should print lightly.

NOTE: The restoring cam follower eccentric should be adjusted all the way up while the anvil is being set. On 7X5 machines, the carrier buffers must also be moved up out of the way of the anvil.

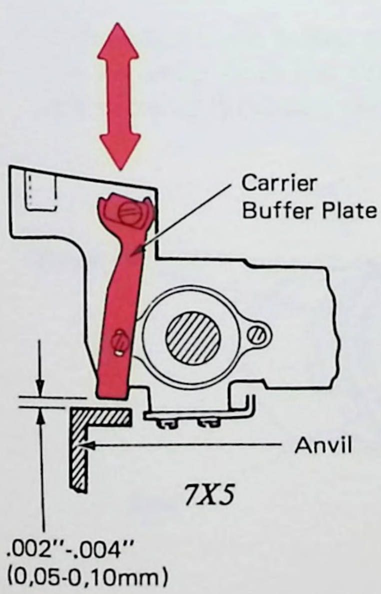


(Right Side View)

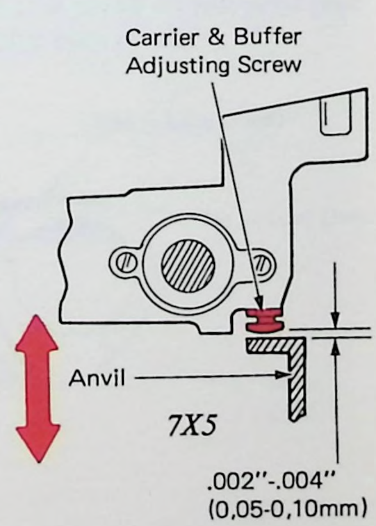


(Right Side View)

7. *Carrier Buffers (Level 1 7X5 only)* – The buffer plate attached to the right side of the carrier and an adjusting screw under the left side of the carrier strike the top of the anvil to prevent the print shaft from flexing downward. Each should have .002"-.004" clearance with the top of the anvil.



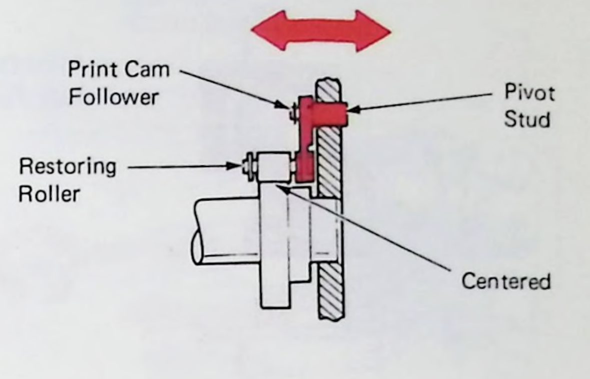
(Right Side View)



(Left Side View)

8. *Print Cam Follower (Level 1)* – The print cam follower must be adjusted to satisfy the following conditions:

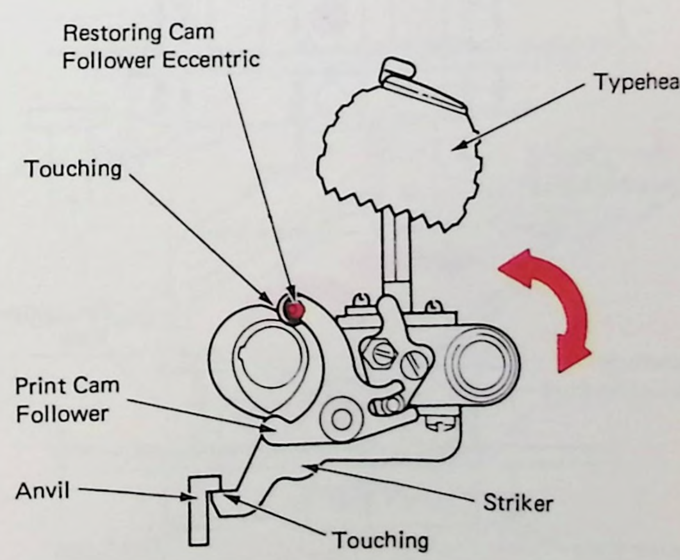
a. Print Cam Follower Stud – Adjust the pivot stud left to right so the rubber roller on the follower is centered on the surface of the restoring cam. The stud is held in place in the carrier casting by a set screw that is accessible from the bottom of the machine.



(Top View)

b. Restoring Cam Follower Eccentric – With the print cam follower at the high point of the cam and the platen removed, hold the typehead toward the rear until it is restricted by the anvil and striker. The roller should just touch the restoring cam. Adjust the eccentric, keeping the high point forward, to satisfy this condition.

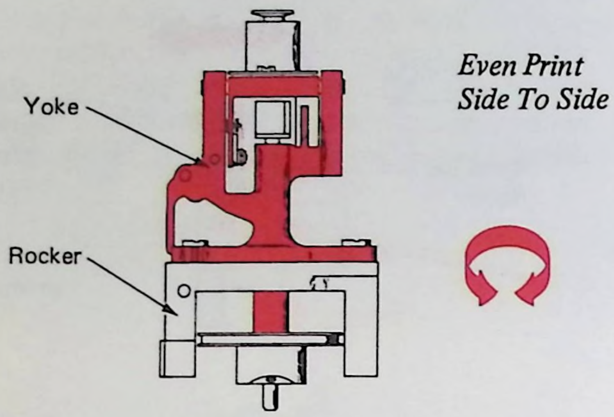
NOTE: If the roller is too close to the restoring cam, it may bind against the cam during print shaft rotation. If too much clearance exists, the typehead may not be restored as quickly as is necessary and blurred characters may result.



(Right Side View)

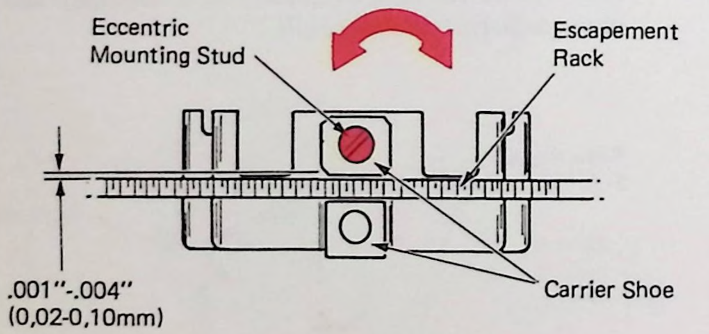
9. *Even Printing* – Position the yoke rotationally under its mounting screws so the density of the left and right sides of a printed character is uniform.

This adjustment will affect the tilt ring homing adjustment, the typehead homing adjustment, and skirt clearance. Be sure to check these adjustments after changing the position of the yoke.

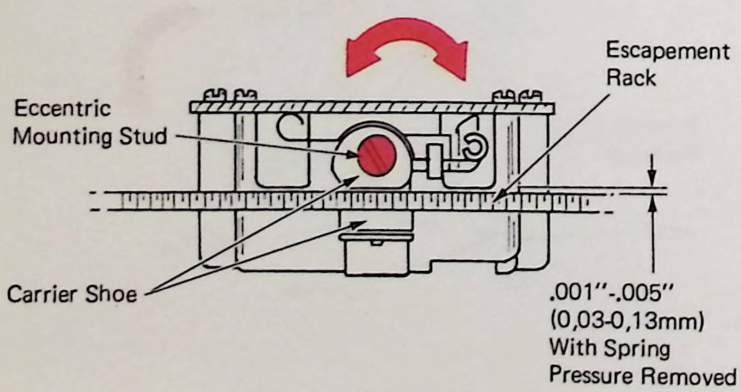


(Front View)

10. *Carrier Shoe* – Adjust the level 1 carrier shoe eccentric mounting stud to obtain .001"-.004" vertical play between the carrier shoes and the escapement rack. The level 2 carriers equipped with the spring loaded carrier shoe should be adjusted for .001"-.005" of vertical movement with the spring pressure removed. This adjustment should be checked at several points along the escapement rack.

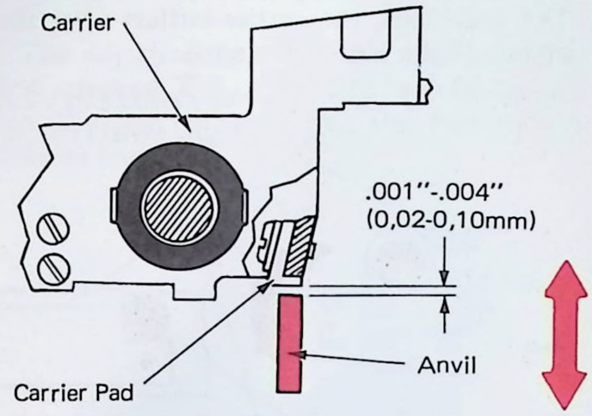


(Level 1 – Rear View)



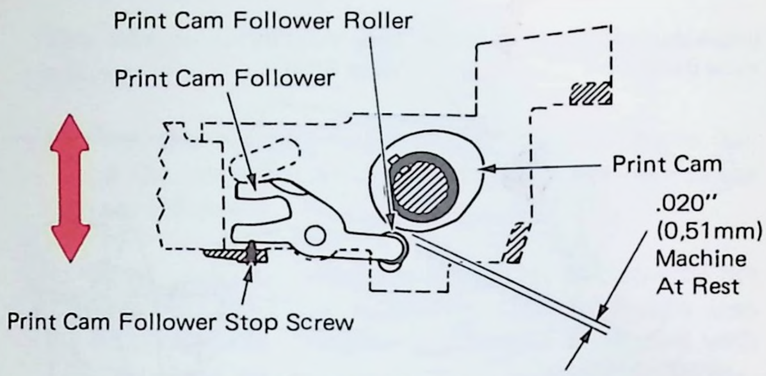
(Level 2 – Rear View)

11. *Anvil (Level 2)* – Adjust both ends of the carrier support vertically to obtain .001"-.004" clearance with the bottom of the carrier pad along the entire length of the writing line. The support is secured to the machine power frame by a binding screw at each end.



(Left Side View)

12. *Print Cam Follower Stop Screw (Level 2)* – Adjust the print cam follower stop screw so the print cam follower roller clears the print cam by .020" when the machine is at rest. This clearance allows the roller to shift from one lobe to the other without rubbing on the cam.

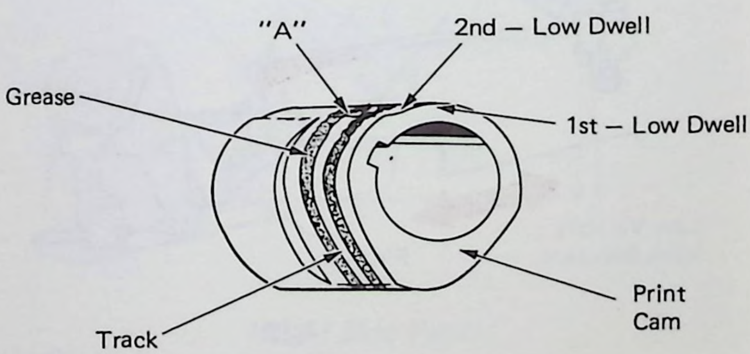


(Left Side View)

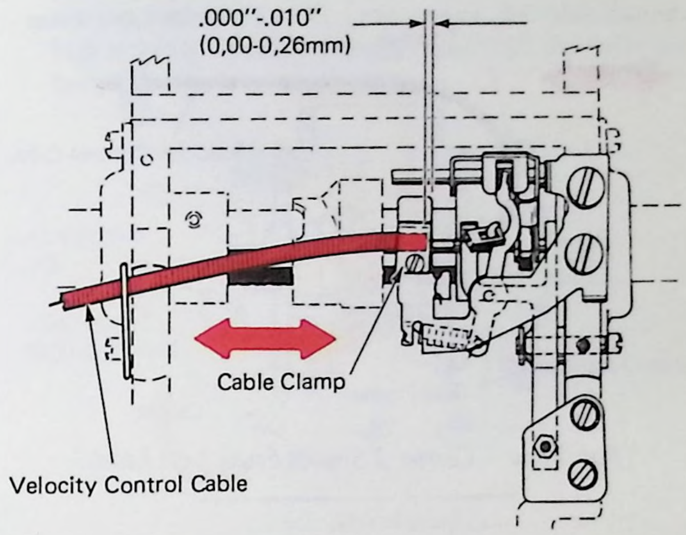
This adjustment may be checked by applying a light film of grease on the print cam and then observing the track that the roller makes in the grease when the machine is hand cycled. If the stop screw has been adjusted properly, the roller track in the grease should begin at point "A" on the print cam. This is the beginning of the second low dwell on the print cam.

If the roller track begins before point "A", the roller is adjusted too close to the print cam when the machine is at rest. Improper roller to cam clearance may cause the roller to drag on the print cam as it shifts during a low velocity selection. Thus, the roller may fail to shift, or shift improperly. Also, if the roller is adjusted too close to the cam at rest, it may receive a ski-jump effect from the print cam as it attempts to follow the print cam from the first low dwell to the second low dwell. This will create excessive noise and wear along with adverse effect on typehead impact velocity.

If the roller track begins after point "A", the roller rests too far away from the first low dwell of the print cam and a loss of typehead velocity may result.

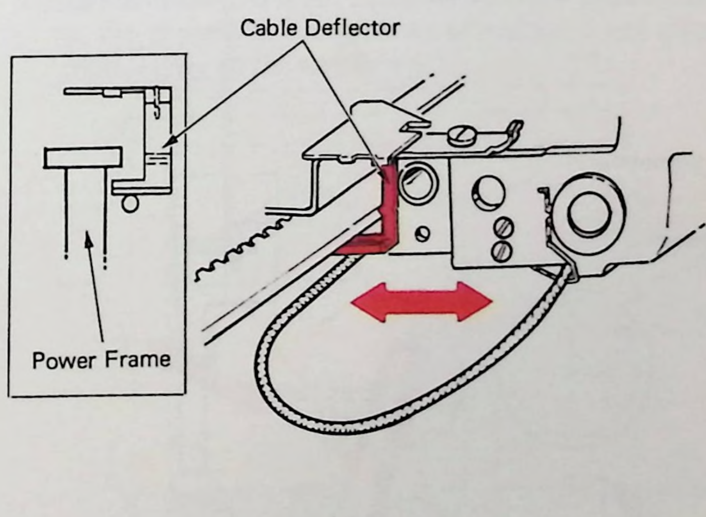


13. *Velocity Control Cable Clamp (Level 2)* – Adjust the cable sheath left to right under the carrier clamp until the end of the sheath is flush to .010" recessed with the right hand edge of the cable clamp. This adjustment prevents the yoke actuating lever from choking off against the cable sheath.



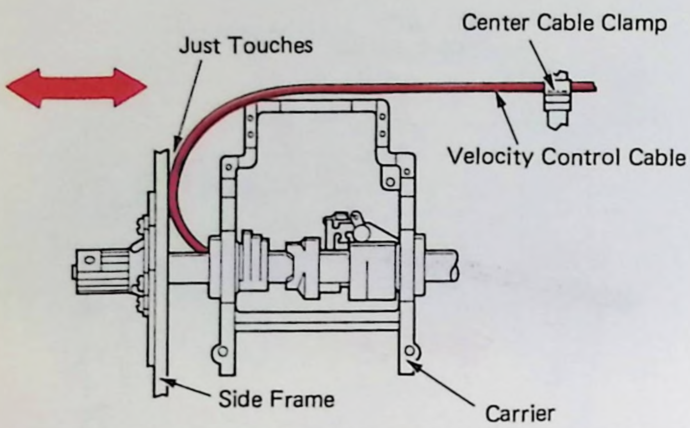
(Level 2 – Bottom View)

14. *Carrier Cable Deflector (Level 2)* – Form the deflector to the rear as far as possible without touching the power frame.



(Left Side View)

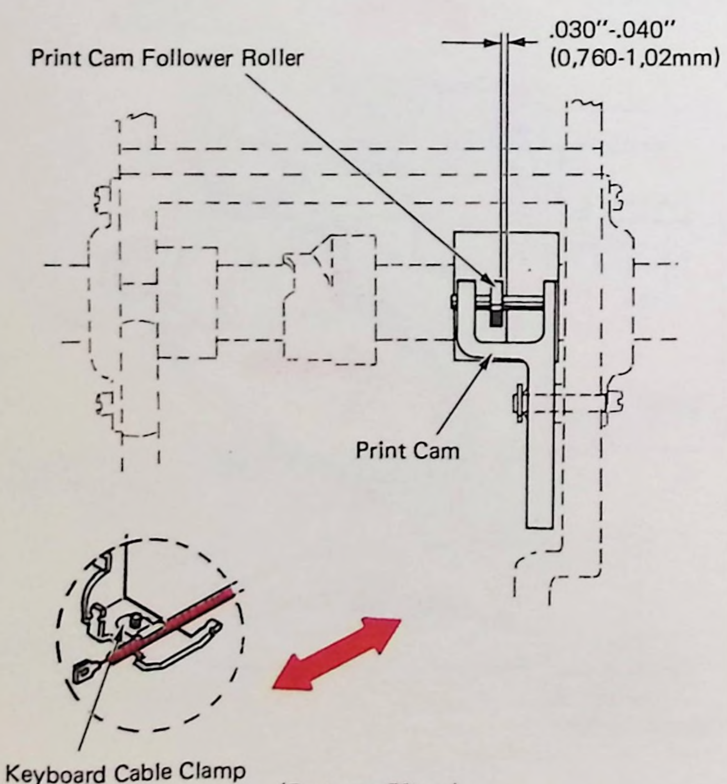
15. *Center Cable Clamp (Level 2)* – Position the cable sheath left to right within the center cable clamp so the bend in the cable will just touch the left side frame when the carrier is resting two spaces from the extreme left hand margin. This adjustment allows the carrier to operate freely along the entire writing line and allows the velocity control cable to operate with a minimum of flexing.



(Top View – Carrier 2 Spaces From Left Limit)

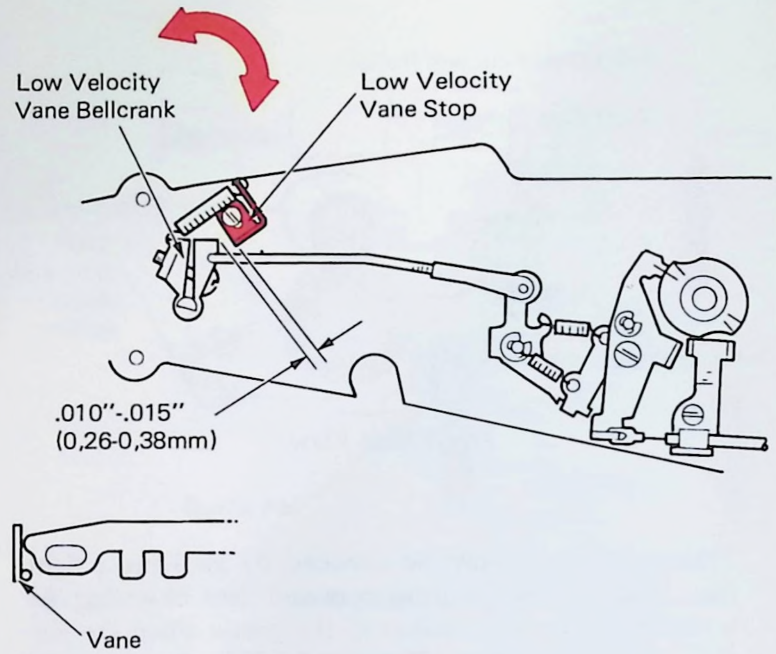
16. *Velocity Control Keyboard Cable Clamp (Level 2)* – Adjust the cable sheath front to rear under the clamp so the print cam follower roller will shift onto the low velocity lobe of the print cam by the width of the roller plus .030"-.040" when a low velocity character is half cycled. Moving the cable sheath to the rear will produce more motion to the roller.

This adjustment should be checked by observing the track of the roller in the grease on the print cam.



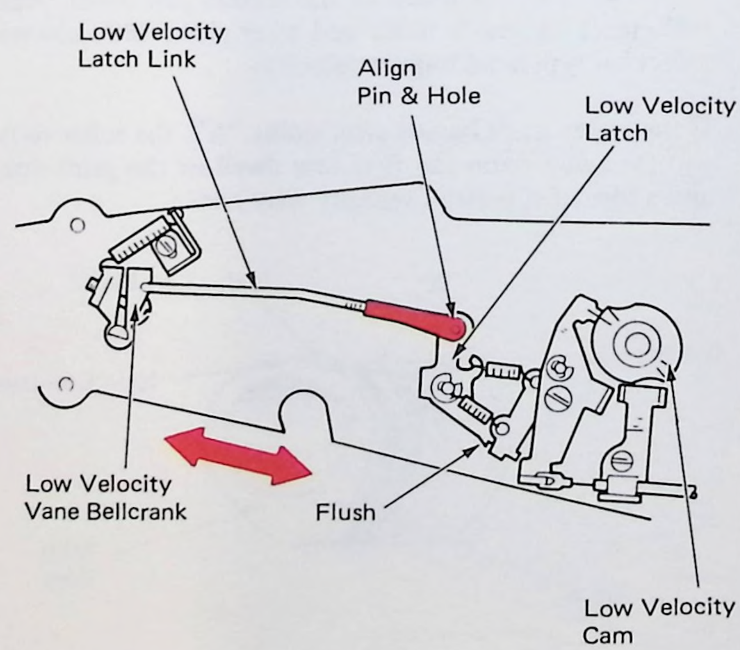
(Bottom View)

17. *Low Velocity Vane Stop* – Adjust the low velocity vane stop for a clearance of .010"-.015" between the stop and the low velocity vane bellcrank when the bellcrank is held at rest.



(Right Side View – Vane Against Interposer At Rest)

18. *Low Velocity Latch Link* – With the machine at rest, the low velocity latch link should be adjusted to just span the distance between the low velocity vane bellcrank and the low velocity latch. This adjustment ensures the latch will take a full bite on the adjustable stop and there will be no lost motion in the system.



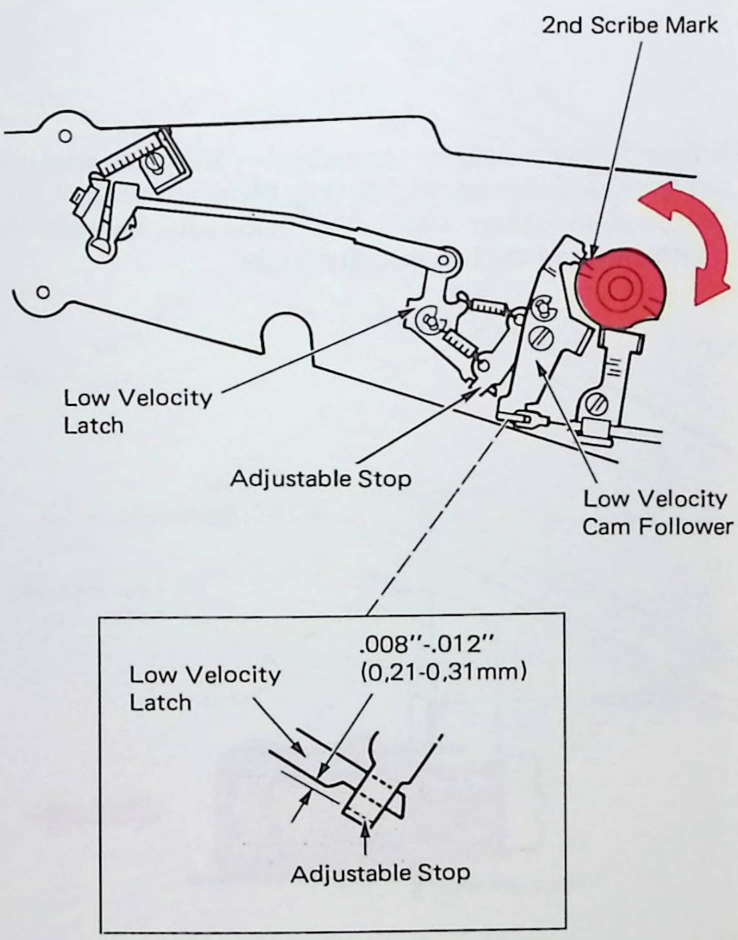
(Right Side View)

19. *Low Velocity Cam Adjustment (Level 2)* – When a low velocity character is slowly hand cycled, the low velocity latch should clear the adjusting stop on the cam follower by .008"-.012" just as the cam follower scribe mark lines up with the second scribe mark on the low velocity cam. Advance or retard the cam to satisfy this condition.

This adjustment can easily be made in the following manner:

a. With the machine at rest, align the first scribe line on the low velocity cam with the scribe line on the cam follower.

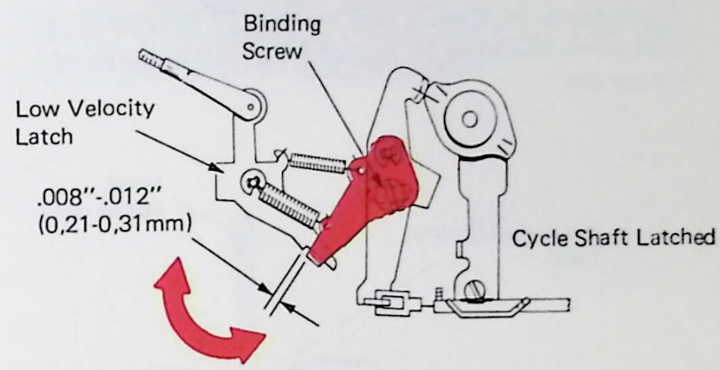
b. Hand cycle a low velocity character and observe the .008"-.012" clearance between the latch and stop when the cam follower scribe line is aligned with the second scribe line on the low velocity cam. Refine the cam adjustment slightly to satisfy this condition.



(Right Side View)

20. *Low Velocity Cam Follower Stop (Level 2)* – With the cycle shaft latched at rest, adjust the low velocity cam follower stop for .008"-.012" clearance with the low velocity latch. Loosen the binding screw and rotate the low velocity cam follower stop to satisfy this condition.

Too little clearance may prevent latching of the low velocity latch resulting in a continuous low velocity operation for all characters. Too much clearance may allow a slight pull to be produced on the cable during a high velocity operation which could shift the roller partially into the low velocity lobe.

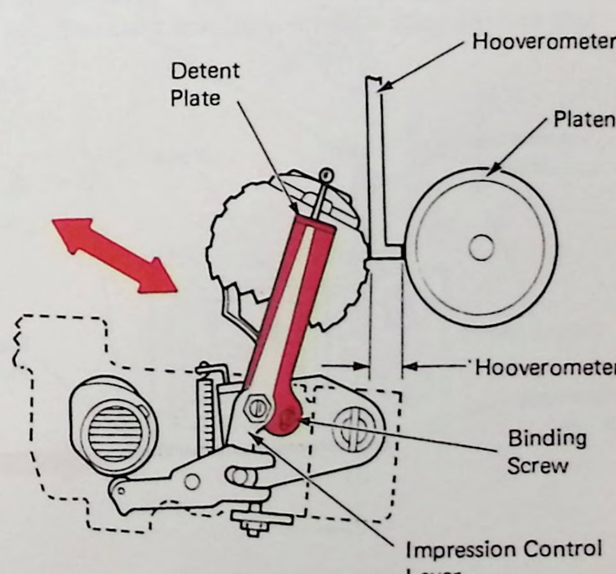


(Right Side View)

21. *Powered Travel* – With the machine latched at rest and the impression control lever set at postion 4, loosen the binding screw and move the detent plate front to rear until the foot of the Hooverometer will just span the distance between the center of the 0 tilt, 0 rotate character and the platen.

CAUTION: The copy control lever must be positioned all the way forward when making adjustments number 21 and number 22.

NOTE: If the I/O is not equipped with dual impression, set the impression control lever at position 5 and copy control lever all the way to rear.

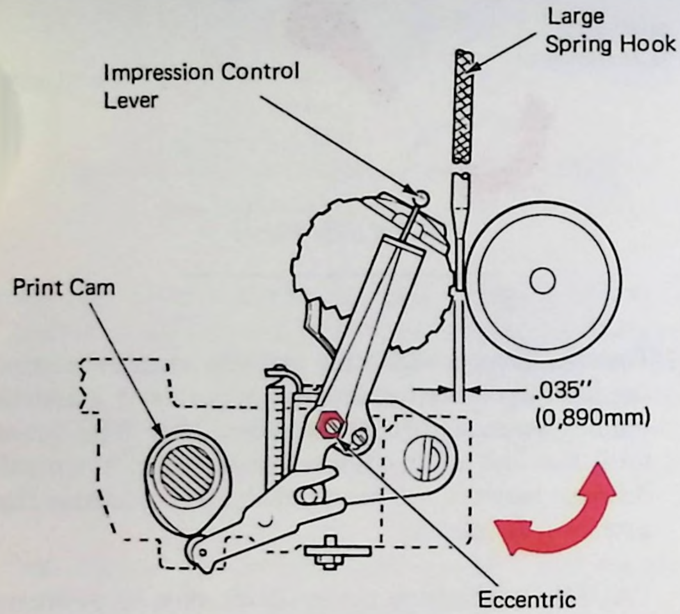


(Right Side View – Stick 4 Position "0" Rotate, Rest Position)

22. *Free Flight* – With the impression control lever set at 4 and 0 tilt, 0 rotate character hand cycled until the machine is resting on the high point of the print cam, the pusher end of a large spring hook (.035") should just span the distance between the 0 tilt, 0 rotate character and the platen. Adjust the eccentric on the impression control lever to obtain this condition keeping the high part of the eccentric forward.

NOTE: If the I/O is not equipped with dual impression, set impression control lever at position 5 and copy control lever at D.

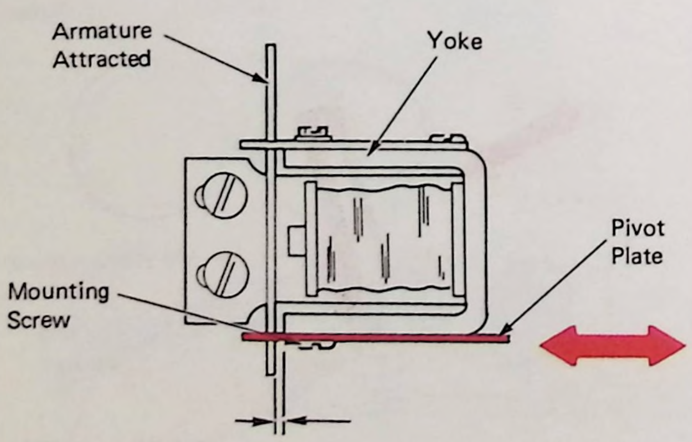
Adjustments number 21 and number 22 directly affect each other and must be adjusted alternately until both are correct.



(Right Side View)

---

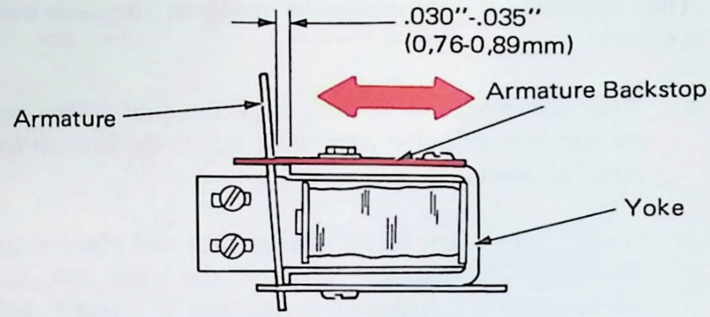
23. *Pivot Plate (Low Velocity Magnet)* – Adjust the pivot plate front to rear for .001"-.003" between the armature and the yoke with the armature attracted.



(Right Side View)

---

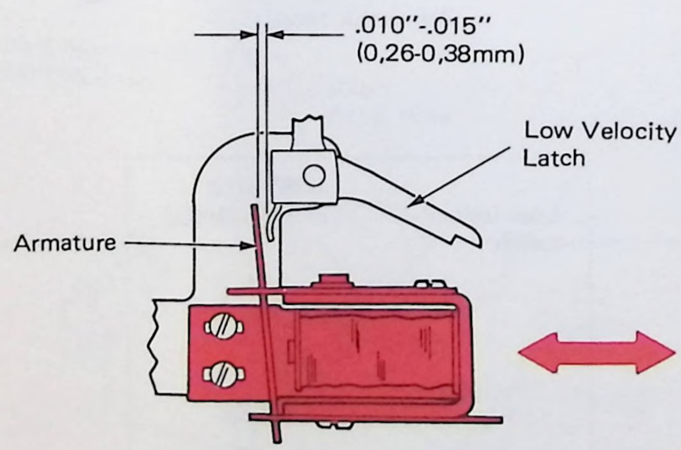
24. *Armature Backstop* – Position the backstop for .030"-.035" between the armature and yoke with the magnet de-energized.



(Right Side View)

---

25. *Low Velocity Magnet Assembly* – With the armature held in a de-energized position, adjust the magnet front to rear to obtain .010"-.015" clearance between the armature and the low velocity latch.



(Right Side View)

The purpose of the escapement mechanism is to control the single space movement of the carrier during each print cycle (Figure 1).

The carrier is under constant mainspring tension. At rest, the escapement pawl, which is mounted on the carrier, engages the escapement rack and prevents the mainspring from pulling the carrier to the right. During an escapement operation, the pawl is temporarily removed from the rack and the carrier moves to the right under mainspring tension until the pawl engages the next tooth on the escapement rack.

Power to operate the escapement mechanism is taken from a double lobed escapement cam mounted on the filter shaft just inside the right hand power frame (Figure 1). Each time a cycle occurs, the filter shaft rotates the cam 180 degrees.

The escapement cam follower pivots on a shaft just to the rear of the escapement cam. A trip link extends to the rear, from the cam follower to the trigger lever.

Each time the filter shaft turns, the escapement cam follower will pivot, pulling on the trip link, causing the trigger lever to rotate about its mounting shafts.

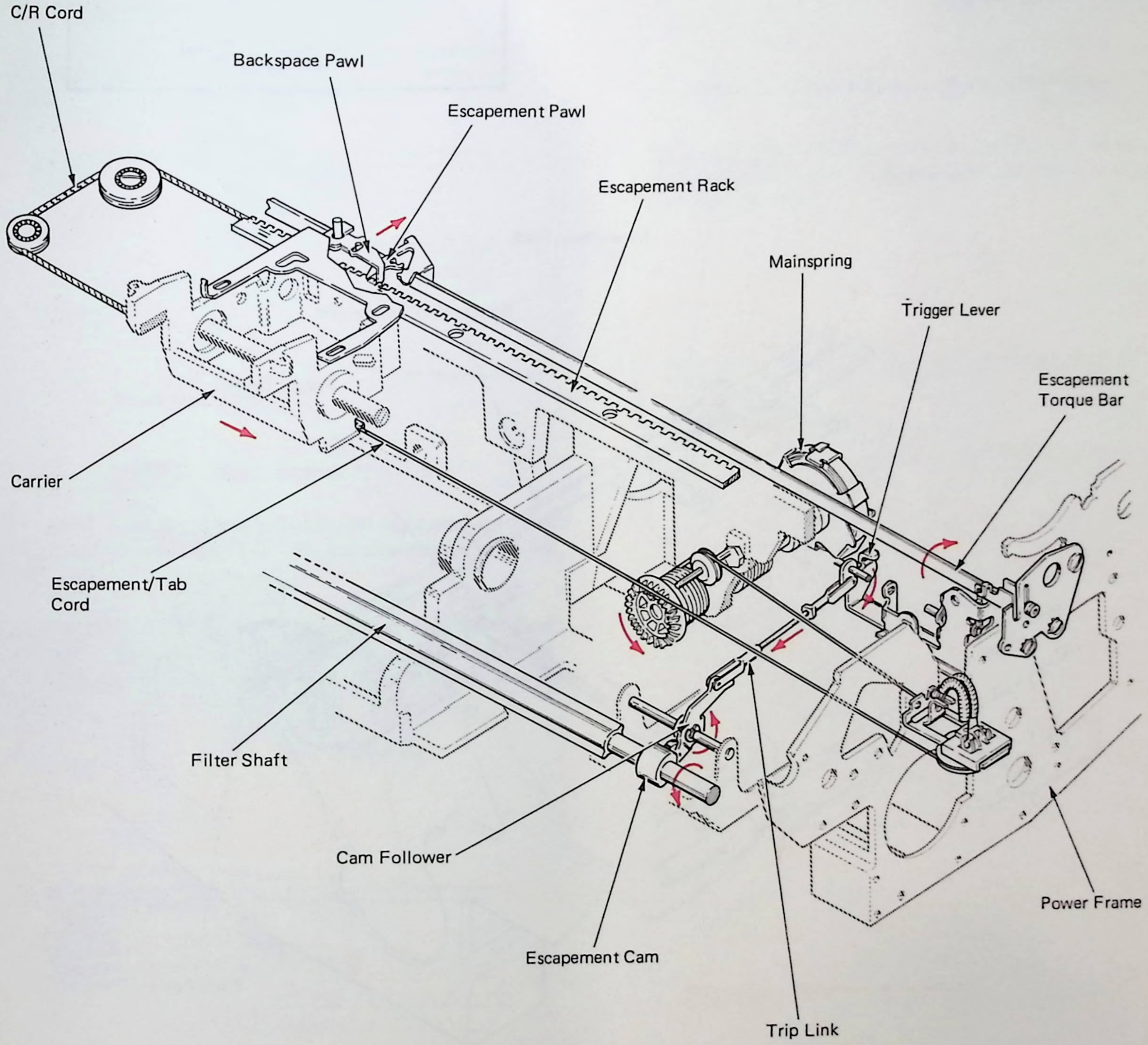


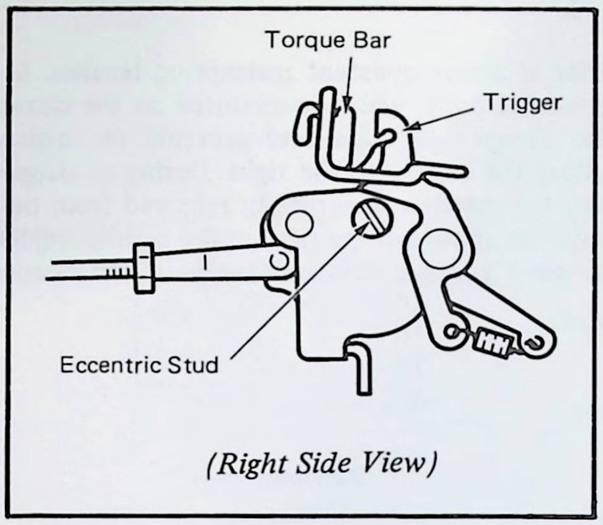
Figure 1 – Escapement Mechanism

TRIGGER OPERATION

An escapement trigger is mounted on the trigger lever (Figure 2). The trigger has hooked shaped lugs that rest above a lug on the right end of the torque bar. During each escapement operation, the rotation of the trigger lever causes the trigger to move downward. This downward movement of the trigger causes the torque bar to rotate.

The torque bar pivots between the sides of the power frame, just to the rear of the escapement rack.

The pivot point of the torque bar is near its bottom edge. The escapement pawl and the backspace pawl each have a lug that extends down just behind the torque bar. As the top of the torque bar pivots to the rear, it will force the lugs of the pawls to the rear causing the tips of the pawls to clear their respective racks.



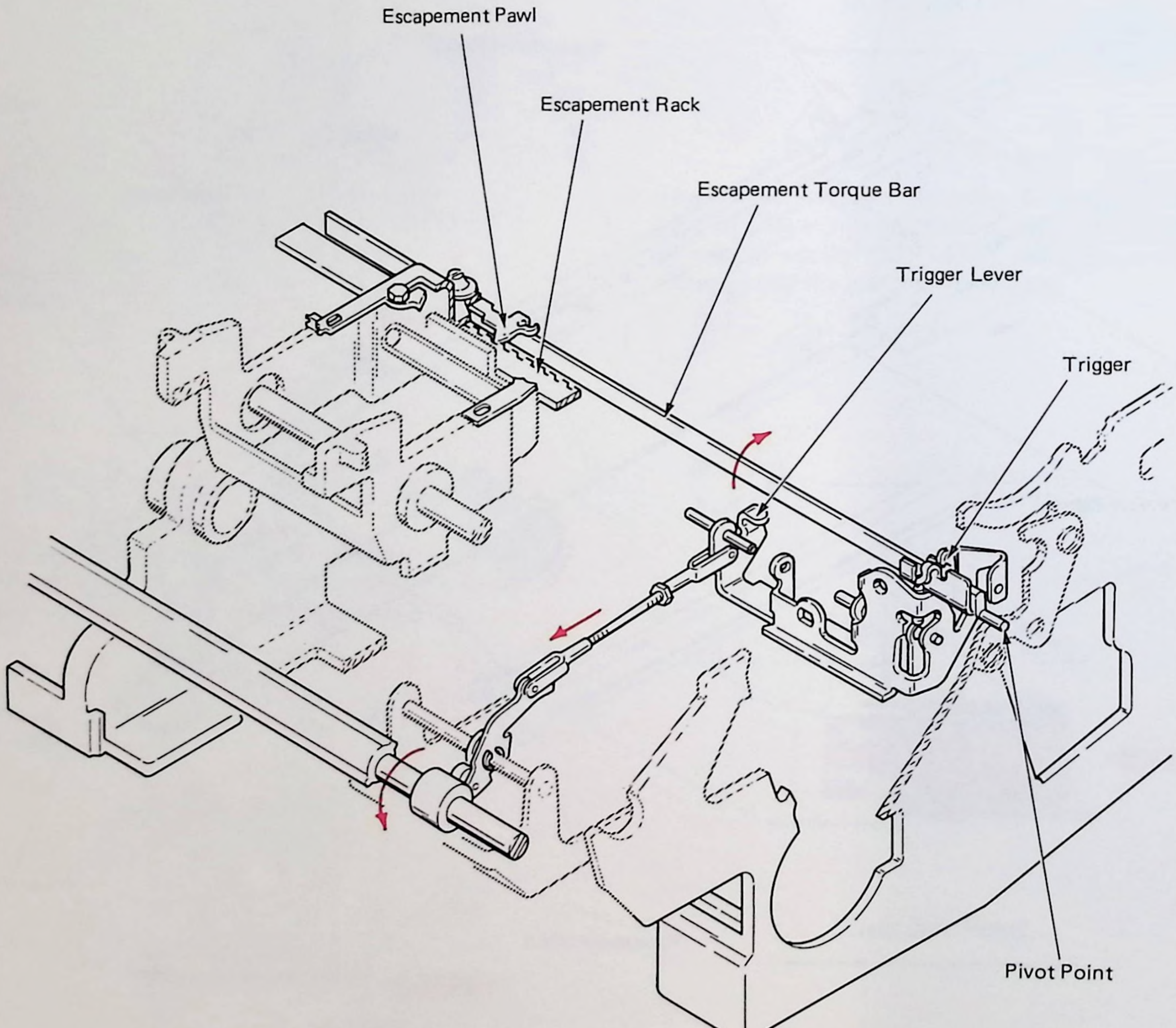


Figure 2 – Trigger Operation

OPERATING SEQUENCE

An escapement operation is obtained by forcing the escapement pawl to the rear, out of engagement with the rack tooth. Due to the slotted mounting hole, as soon as the pawl clears the escapement rack tooth it is snapped to the right by the pawl spring. The escapement pawl is allowed to move to the front into engagement with the next tooth. The carrier then moves to the right until it comes to rest against the escapement pawl.

Figure 3 shows the escapement and backspace pawls and their associated racks. The pivot stud is attached to the bracket mounted on the carrier. The backspace pawl is shown for reference only. Its relationship is described in detail in the backspace section of this manual.

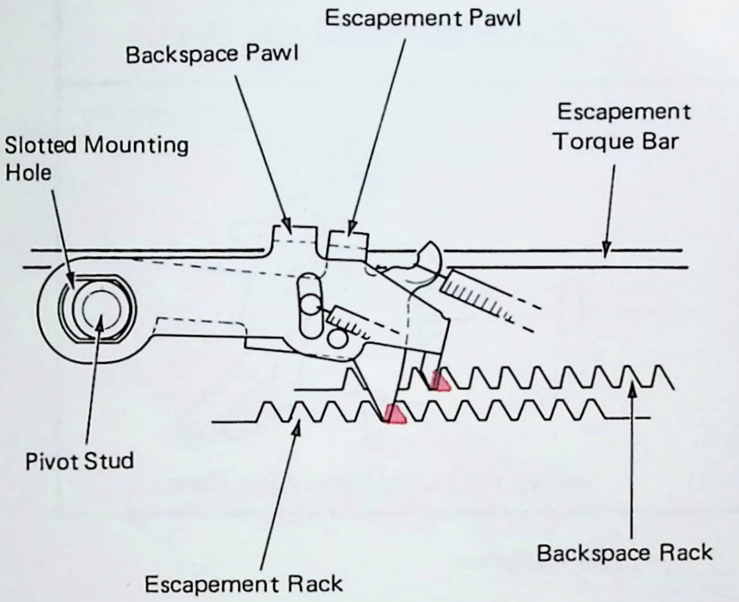


Figure 3 – Pawls At Rest (Top View)

The carrier is always being pulled to the right, and the pivot stud is against the right edge of the elongated slot in the pawls.

Figure 4 shows the torque bar operated. The pawls have been pulled free of their racks and the spring tension has pulled the pawls to the right before the carrier has started to move.

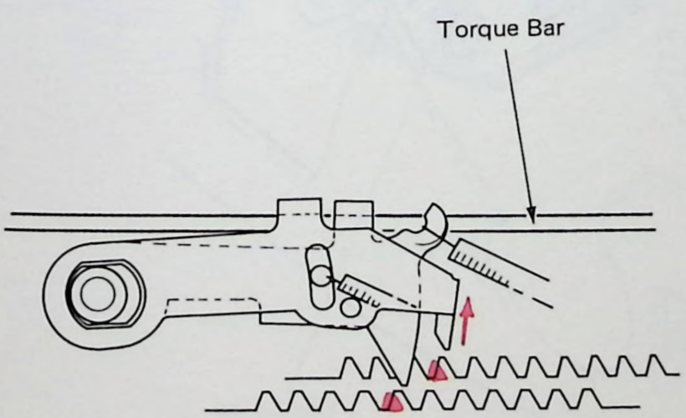


Figure 4 – Torque Bar Operated (Top View)

In figure 5, the torque bar is returning to its rest position and the pawls are dropping into the next tooth of their racks. The carrier has not moved.

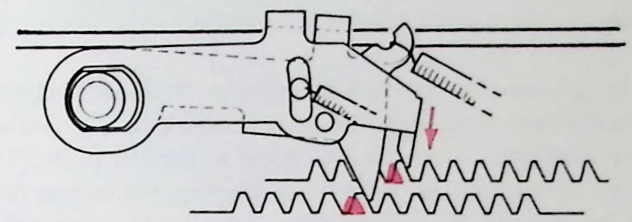


Figure 5 – Pawls Returning To Rest (Top View)

In figure 6, the carrier has moved to the right and the pawls have stopped the pivot stud, and again the carrier is at rest after spacing once.

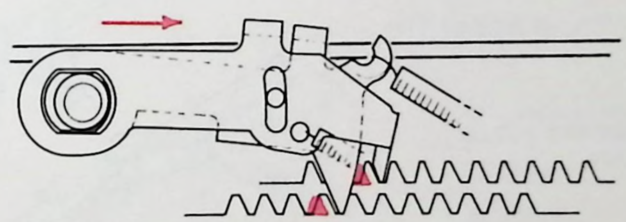


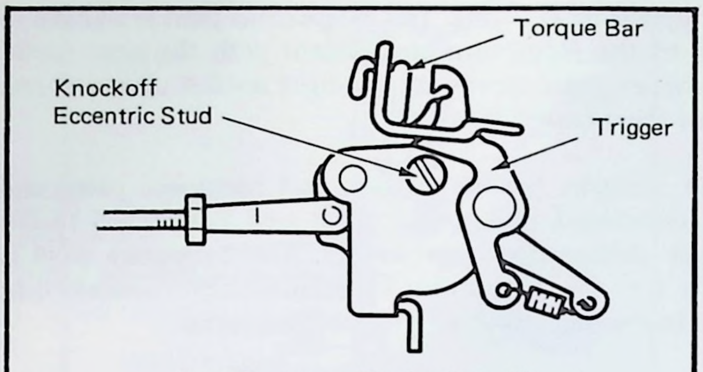
Figure 6 – End Of Operation (Top View)

Rotation of the escapement torque bar is instantaneous and supplies just enough motion to remove the pawls from their racks. The torque bar is immediately rotated back to the rest position by a restoring spring located at the right hand end. This allows the pawls to re-enter their racks to limit the carrier movement to one space (Figure 7).

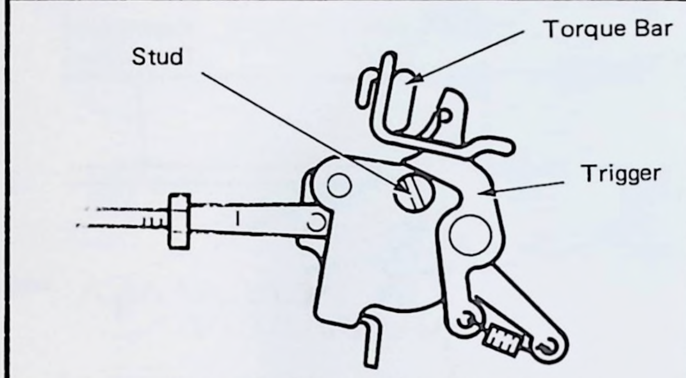
There is a timing consideration in this type of escapement. The torque bar must return to rest before the carrier has moved enough to skip a tooth on the racks.

The trigger lever is operated by motion transmitted from the escapement cam, therefore, it can only restore as fast as the cam can rotate from the high point to the low point. To prevent the escapement pawl from skipping, the torque bar must be allowed to restore more quickly. An adjustable knockoff eccentric stud causes the trigger to cam off of the torque bar lug just after the pawls have been removed from the rack. The torque bar can then restore without waiting for restoration of the trigger and the trigger lever.

Because of the force required to trip the pawls out of their racks, the torque bar tends to bow toward the front instead of pushing the pawls to the rear. This is eliminated by the head on the pawl pivot stud extending down from the escapement bracket directly in front of the torque bar. On long carriage machines, an additional support is given to the escapement torque bar to prevent it from bowing to the rear. A backstop mounted to a stud in the machine power frame provides the backing (Figure 7).



Rest Position (Right Side View)



Active Position (Right Side View)

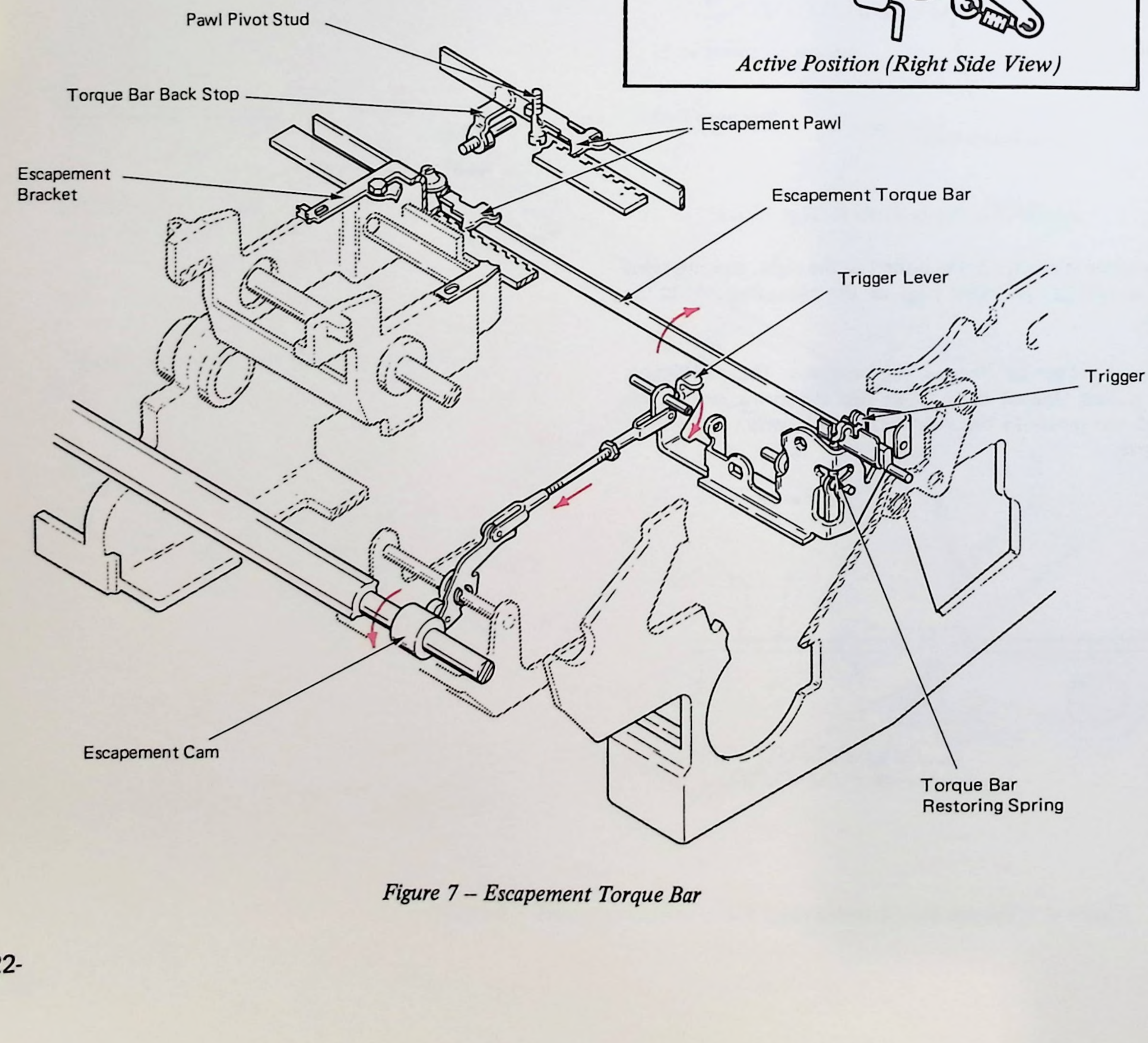


Figure 7 – Escapement Torque Bar

The mainspring is mounted near the back of the machine and engages the escapement shaft (Figure 8).

The escapement shaft extends forward through a backplate and the power frame. Located on this shaft are two drums. Attached to each drum is a nylon cord. The escapement/tab cord is wound several turns around the escapement cord drum, then to the right over a guide roller just prior to passing through the right side of the machine. The cord passes around a tension pulley and back through the power frame and connects to the right hand side of the carrier.

The carrier return cord is wound in the opposite direction around the carrier return cord drum, passes around two pulleys and connects to the left side of the carrier.

Mainspring tension is applied to the carrier through the escapement tab cord to move the carrier to the right during an escapement operation. As the escapement cord drum takes up cord, the carrier return cord drum plays out cord. This allows the tension pulley to maintain constant tension on the carrier and also allows the mainspring to be rewound during a carrier return operation.

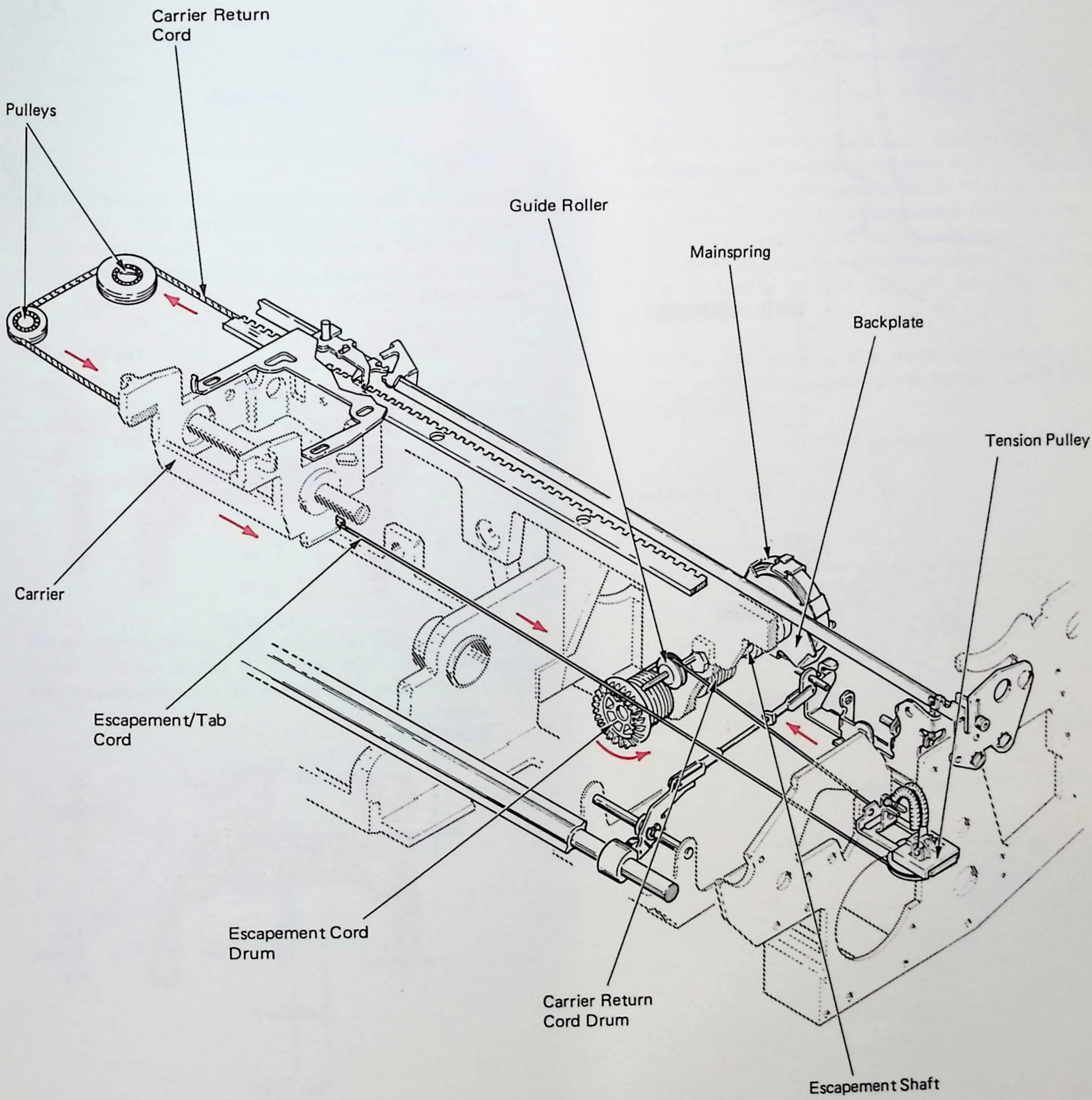
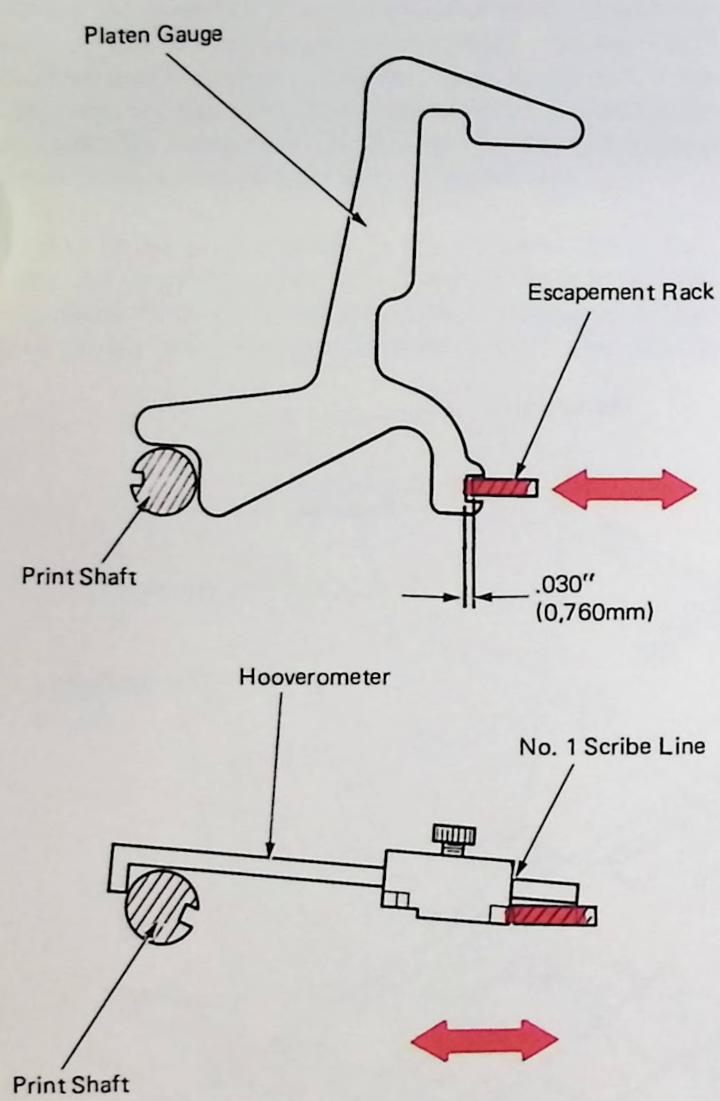


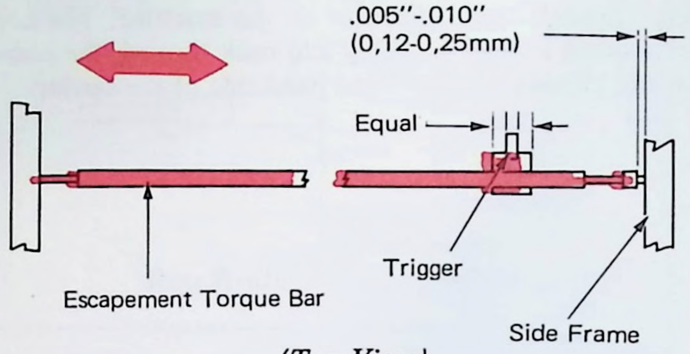
Figure 8 – Mainspring Tension

1. *Escapement Rack* – With the print shaft rotated so the keyway is down, position the platen gauge to rest on the print shaft and the escapement rack. The correct position of the escapement rack is the distance spanned by the gauge plus .030". Adjust the escapement rack to this dimension and parallel to the print shaft. If the platen gauge is not available, the escapement rack position may be set from the No. 1 scribe line on the hooverometer. It should just span the distance from the print shaft.



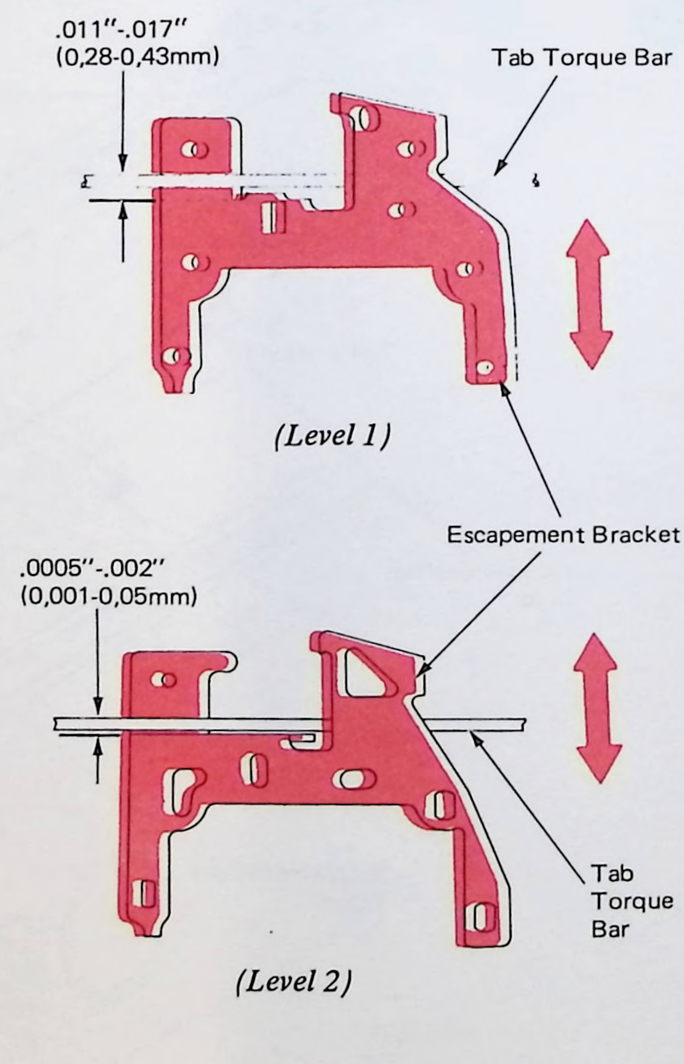
(Right Side View)

2. *Escapement Torque Bar (Level 1)* – Adjust the escapement torque bar .005"-.010" end play with the escapement trigger centered on the escapement bar lug.



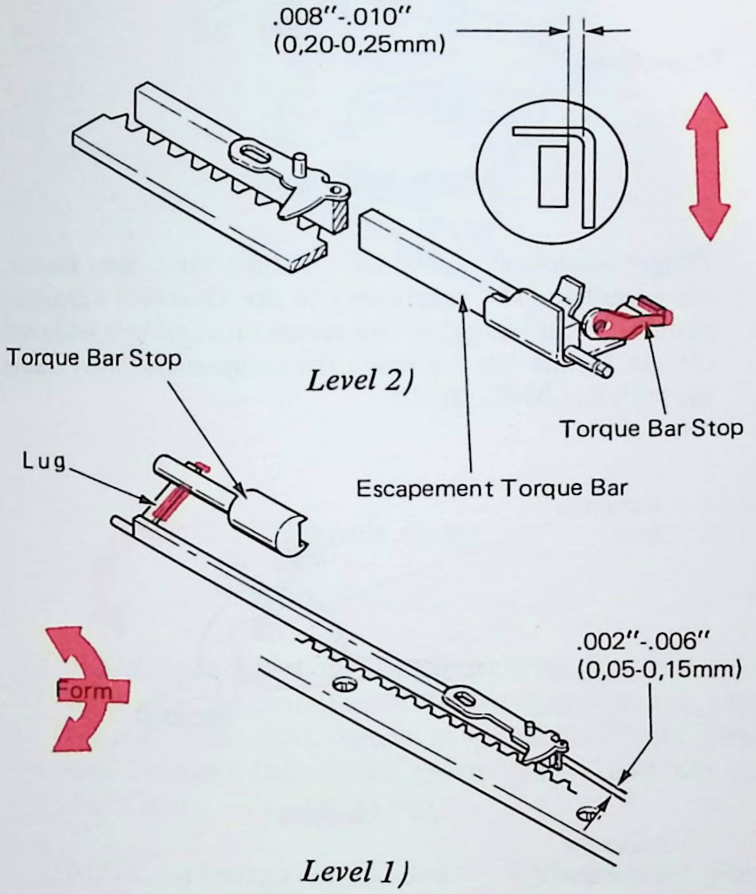
(Top View)

3. *Escapement Bracket* – Position the escapement bracket to parallel the tab torque bar with .011"-.017" clearance for level 1 or .0005"-.002" clearance for level 2. Be sure this clearance is not observed at the boss on the escapement bracket.



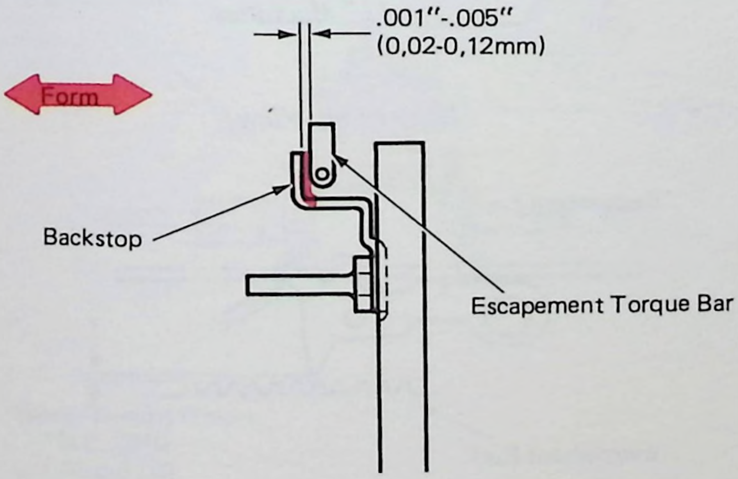
(Top View)

4. *Escapement Torque Bar Stop* – Adjust the escapement torque bar stop to obtain .008”-.010” clearance between the rear of the torque bar and the lug on the escapement pawl with all parts at rest. Machines equipped with a formable lug on the left hand end of the escapement torque bar should be adjusted for .002”-.006” clearance between the rear of the torque bar and the lug on the escapement pawl with all parts at rest.



---

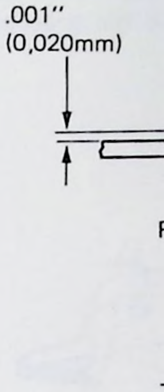
5. *Torque Bar Backstop (15” Machines Only)* – Form the backstop front to rear to obtain .001”-.005” clearance between the stop and the rear of the torque bar.



(Left Side View)

---

6. *Pawl Mounti*
rotationally
end, betweer
escapement
half of its orl

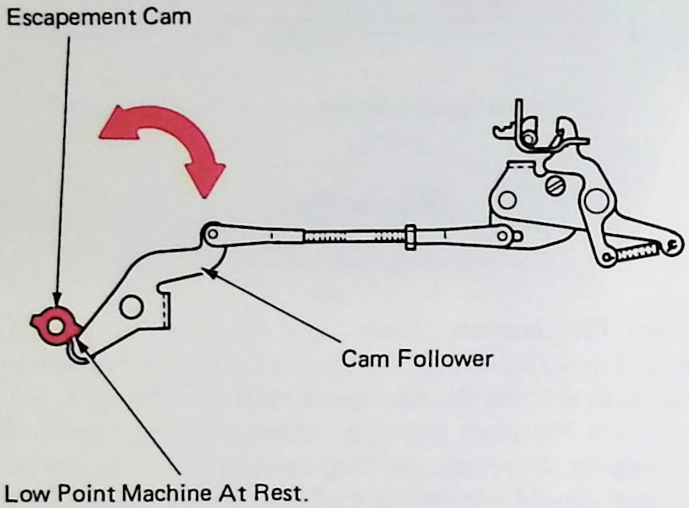


7. *Pivot Pin Ec*
eccentric col
up so that it
prevents the
capement op
centric shoul
to maintai
.002”-.005”.

NOTE: The
rest position
return adjust

8. *Escapement Cam* – With the machine at rest, adjust the cam radially on the filter shaft so the cam follower roller is resting at the start of the low dwell.

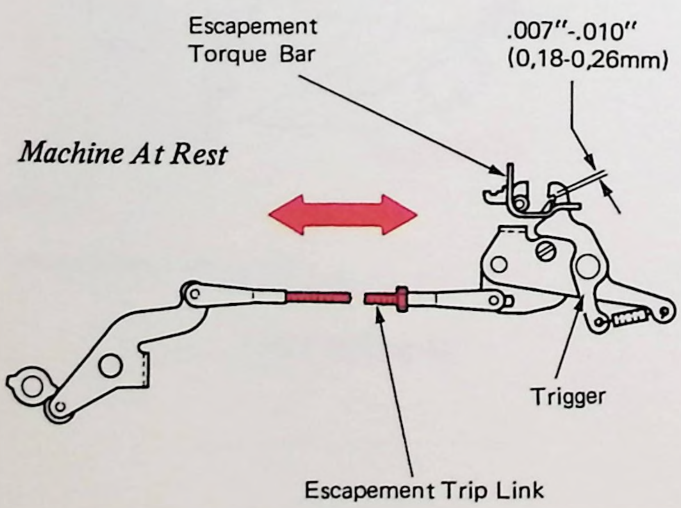
On machines equipped with the old-style spacebar lockout mechanism, the lockout cam adjustment must be checked each time the escapement cam adjustment is changed. Advancing or retarding the escapement cam could allow the lockout cam to disable the spacebar mechanism.



(Right Side View)

---

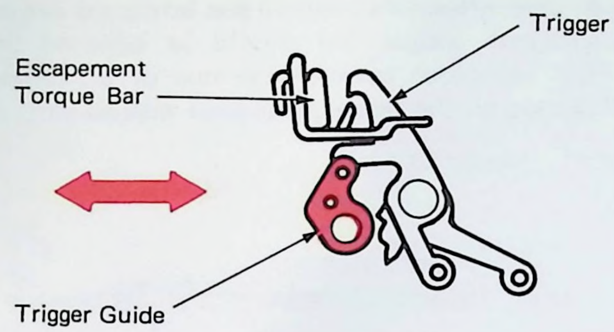
9. *Escapement Trip Link* – With the machine latched at rest, adjust the escapement trip link to obtain .007"-.010" clearance between the hook on the trigger and the extension on the escapement torque bar, use the closest lobe of the print escapement cam. Be sure the trigger lever upstop is not restricting the trigger.



(Right Side View)

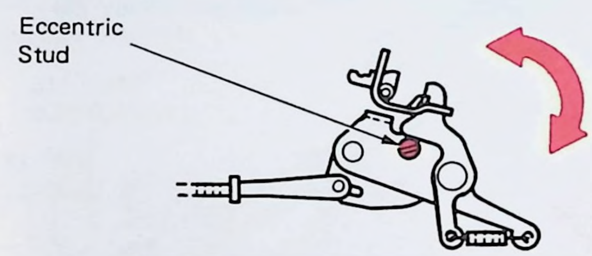
---

10. *Trigger Knockoff (Level 1)* – Adjust the trigger guide so the escapement trigger will cam off the torque bar lug when the escapement pawl clears the rack by .010"-.015".

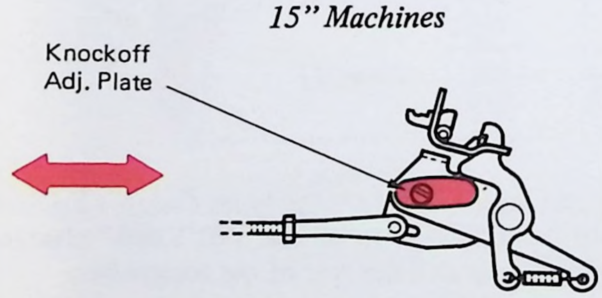


(Right Side View)

Trigger Knockoff (Level 2) – Adjust the trigger knockoff eccentric (15" machines) or the knockoff adjusting plate (11" machines) so the escapement trigger will cam off the torque bar lug when the escapement pawl clears the rack by .010"-.015".

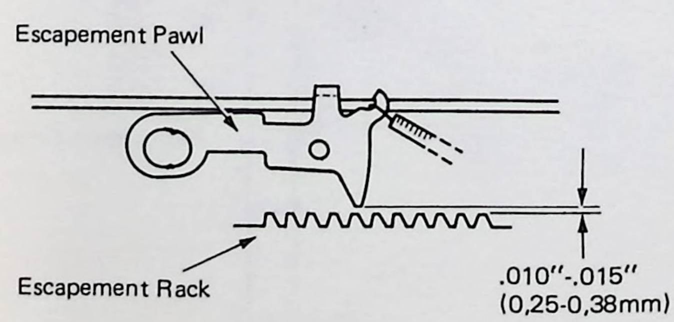


15" Machines



11" Machines

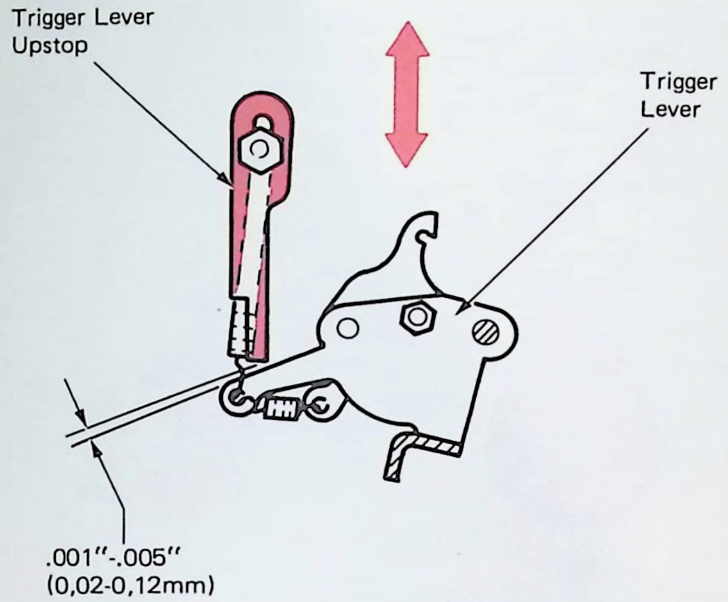
(Right Side View)



(Top View)

---

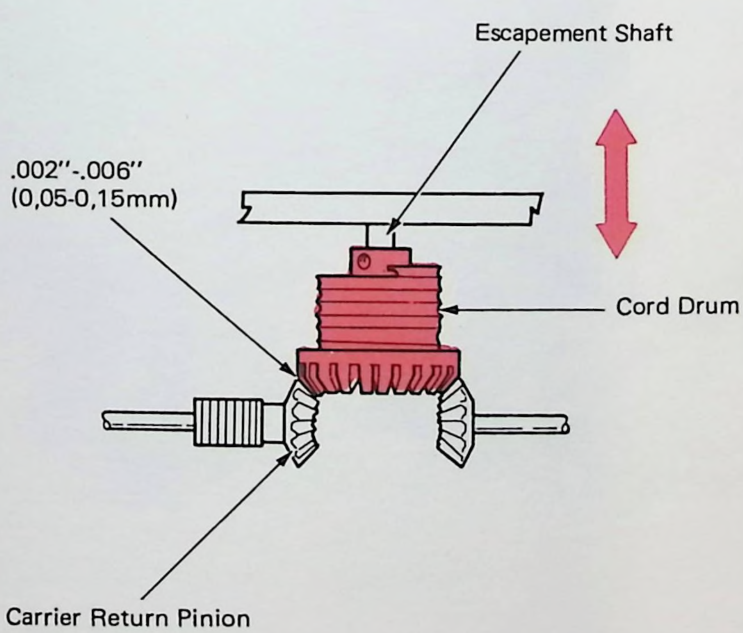
11. Trigger Lever Upstop (15" Machines Only) – With all parts at rest, adjust the trigger lever upstop vertically to obtain .001"-.005" clearance between the upstop and the trigger lever.



(Left Side View)

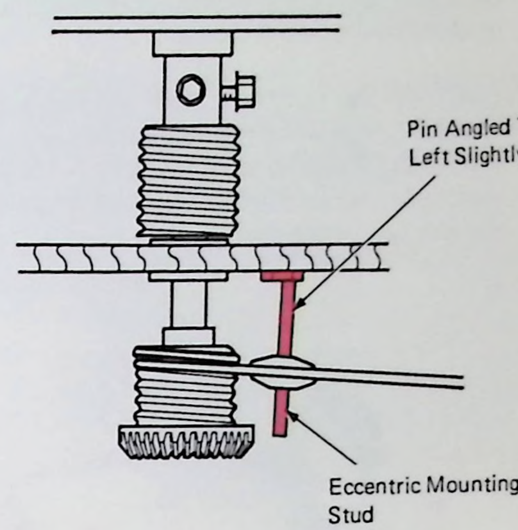
12. Tab/Escapement Cord Drum – With the escapement shaft end play removed in the forward direction, adjust the cord drum front-to-rear to obtain .002"-.006" backlash between the carrier return pinion and the cord drum gear.

NOTE: Adjustment affected – TAB governor pinion and C/R pinion.

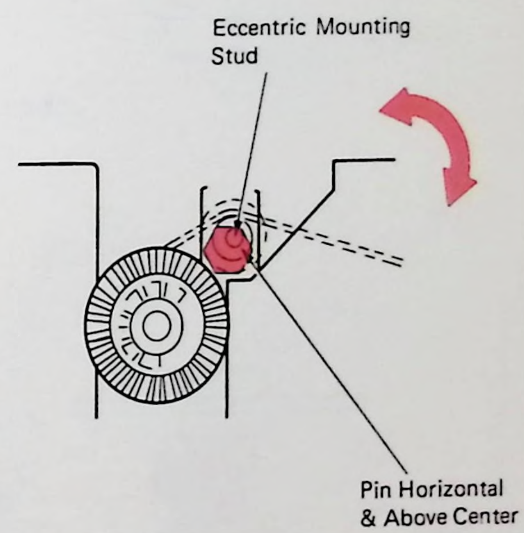


(Top View)

13. Guide Roller Eccentric – The eccentric mounting stud for the front guide roller should be set so that the pin is horizontal and above center on the eccentric. The pin will then be angled toward the left slightly.



(Top View)

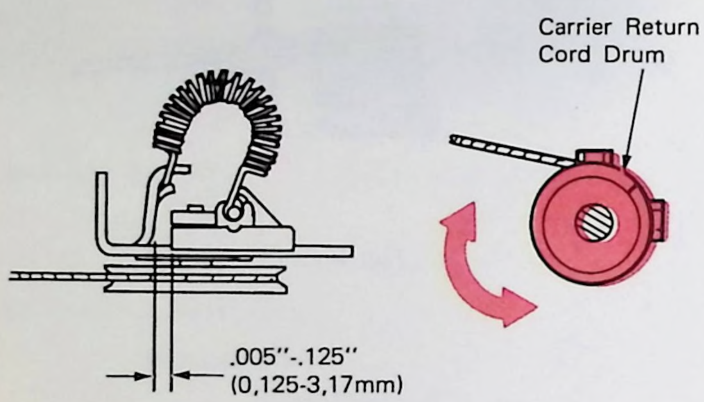


(Front View)

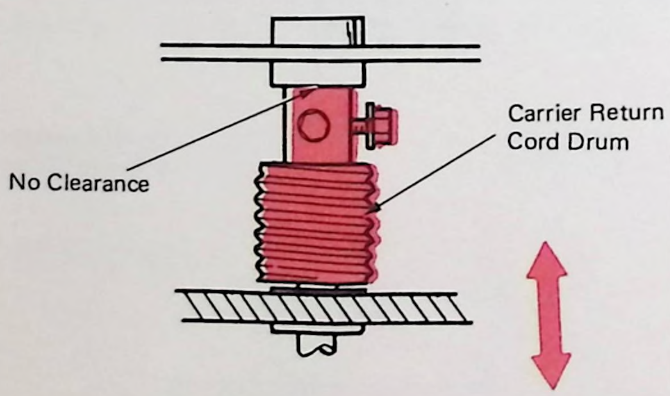
14. *Cord Tension* – With the cords properly threaded, adjust the carrier return cord drum for a clearance of .005"-.125" between the pulley pivot nut and the pulley bracket.

The position of the pulley ensures that it will not contact the cover as it compensates for the cord stretch. Adjusting the pulley nearer the power frame puts an unnecessary load on the cords.

CAUTION Be sure to remove all end play from the escapement shaft before tightening the carrier return cord drum. End play is removed by holding the escapement shaft forward while the cord drum is moved to the rear against the rear bearing.



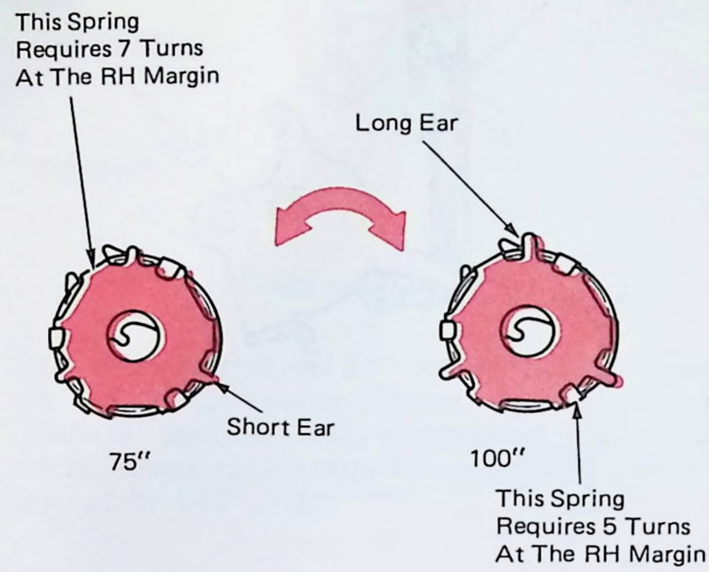
(Front View)



(Top View)

15. *Mainspring Tension* – With the carrier resting at the extreme right hand margin, wind the short eared mainspring seven turns. The long eared mainspring should be wound five turns.

CAUTION: The mainspring should be handled with care to prevent it from slipping when the tension is being increased or decreased.



(Rear View)

The operational control mechanism contains all of the parts necessary to initiate the spacebar, backspace, tab, carrier return and index operations. These operations can be initiated from the keyboard by an operator or from a remote source through the use of magnets. The operational transmit contacts provide an electrical indication, to the remote source, to indicate the function being performed. Two "C" contacts, called C5 and C6, provide the gating signals for both input and output operations.

The operational theory for each of the five operations outlined above is covered in detail in their respective sections of this manual. The operational theory and adjustments in this section will apply to all of the operational control mechanisms. The operational control mechanism consists primarily of five interposers and an operational cam assembly (Figure 1). Each interposer performs the same basic function; to condition the machine components so that only the desired operation will take place, and to release one of the two cams so that power will be supplied to that mechanism. Each interposer can be activated from the keyboard or by the magnet which is mounted below it.

There are two levels of operational transmit contacts. The level 2 contacts will be covered as part of the general theory. The level 1 contacts are described later in this section.

The two operational cams are located on the right side of the operational shaft just inside the power frame. The left hand cam is a double lobed cam which turns 180° during each cycle. Its purpose is to power the spacebar, backspace and tab mechanisms. The right hand cam is a single lobed cam which rotates 360° during each cycle. It powers the carrier return and index mechanisms.

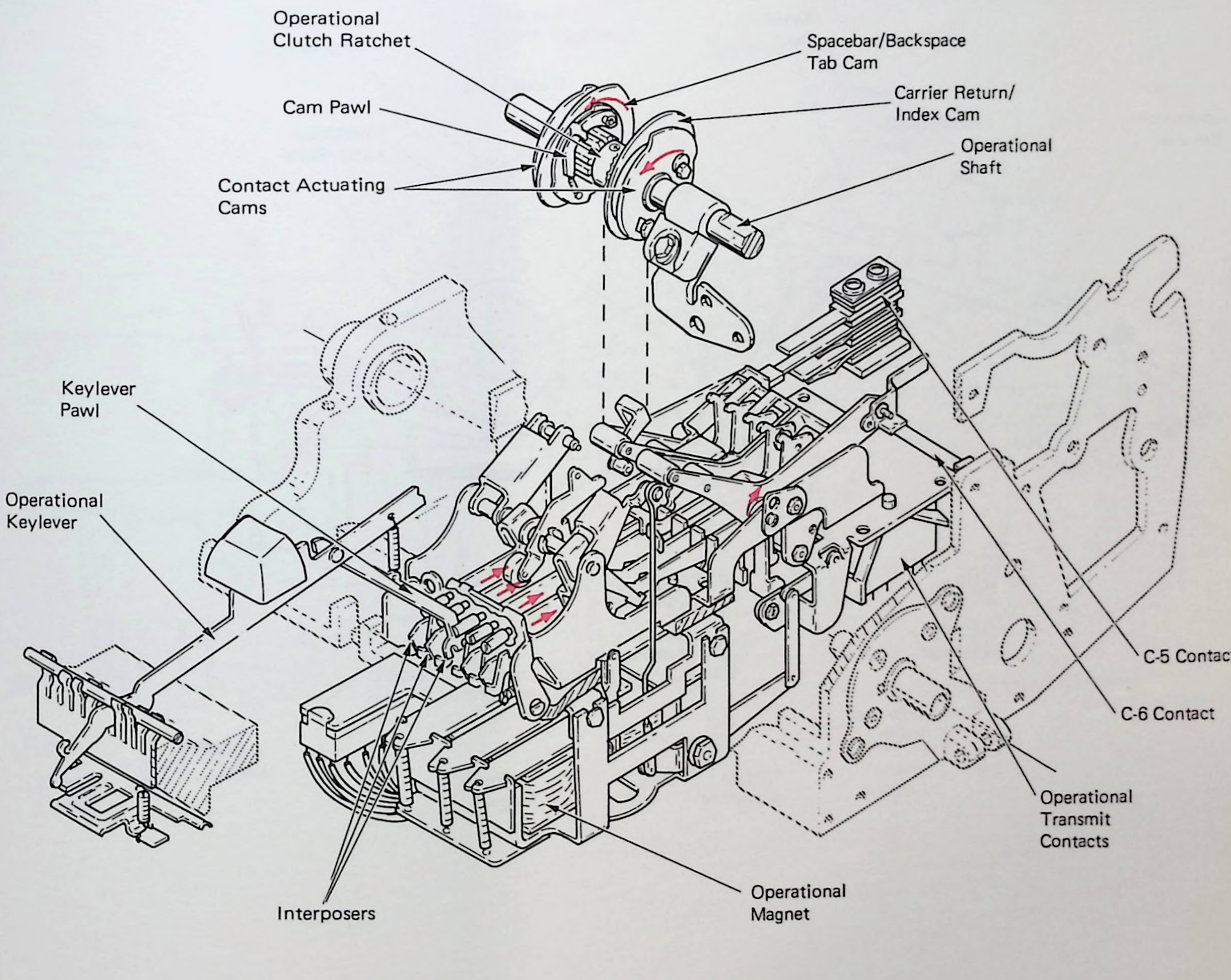


Figure 1 – Operational Control Mechanism

INTERPOSER RELEASE

An operation may be initiated by depressing one of the operational keylevers or by a signal from some remote source that energizes an operational magnet (Figure 2). When energized, the magnet armature moves down pulling on the interposer link which pulls the interposer down away from its latched position.

When an operational keylever is depressed, a lug on the keylever pawl contacts the interposer, forcing it down to release the interposer latch from the interposer latch plate (Figure 2). Some machines are equipped with repeat operational features. Repeat operation of the backspace, spacebar, carrier return or index mechanisms is caused by a repeat lug on the keylever pawl, when the keylever is fully depressed. This lug prevents the interposer from relatching on the latch plate.

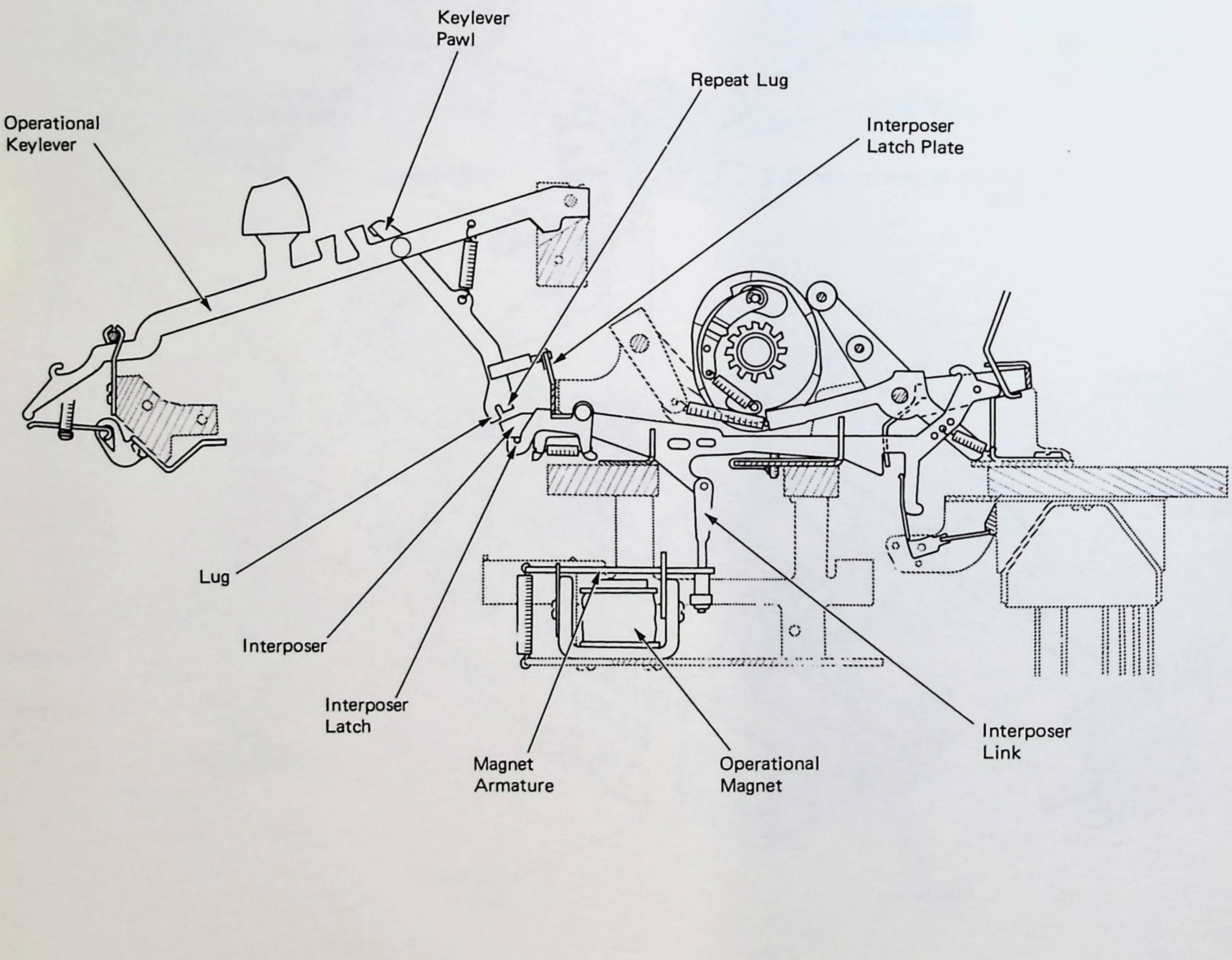


Figure 2 – Operational Control Mechanism (At Rest) (Right Side View)

INTERPOSER FUNCTIONS

As soon as the interposer latch has cleared the latch plate, (Figure 3) the interposer is pulled to the rear by its spring. When the interposer moves to the rear, it performs three functions:

1. The interposer follower is allowed to pivot to the rear, removing the contact latch from the operating path of the operational transmit contact actuator. Later in the cycle this contact will provide a signal to the remote source indicating which operational function has been initiated.
2. A lug on the bottom of the interposer contacts the clutch release arm, rotating it down at the front allowing the cam wheel to be released. When the clutch release arm releases the cam wheel, the cam wheel will rotate allowing the cam pawl to engage the operational clutch ratchet. The operational clutch ratchet is setscrewed to the operational shaft and rotates whenever the machine is on. The operational cams are mounted on shoulders of the operational clutch ratchet. The operational cams remain stationary on these shoulders until the cam pawl engages the ratchet. When the cam pawl engages the operational clutch ratchet, the cam turns with the operational shaft and ratchet.
3. An extension at the rear of the operational interposer positions an operational latch under its cam follower.

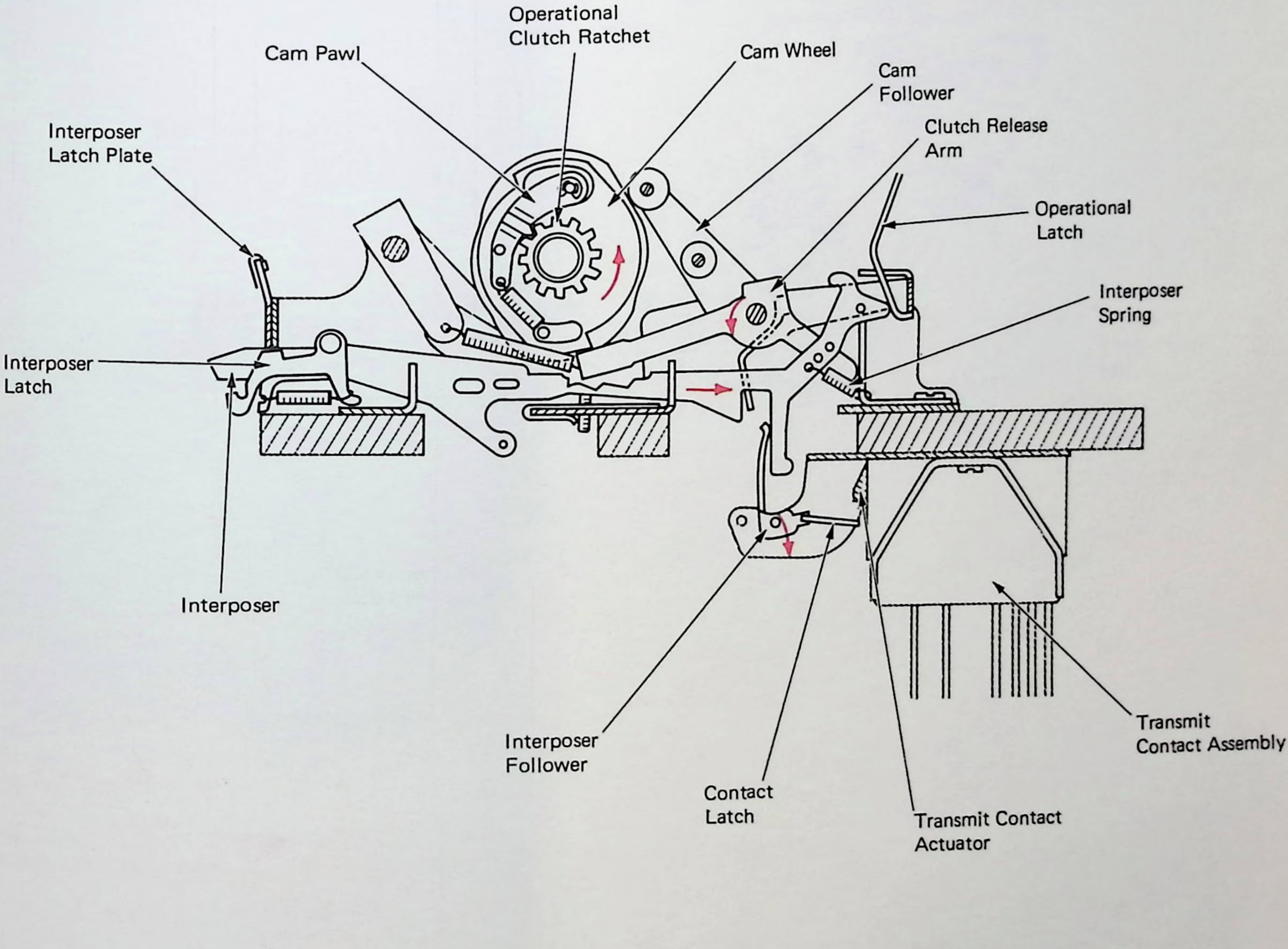


Figure 3 – Operational Control Mechanism (Operated) (Right Side View)

CAM FUNCTIONS

The rotation of the operational cam assembly performs two functions (Figure 4).

1. The cam follower follows the camming surface of the operational cam from the low point to the high point. This causes the cam follower to pivot around its mounting shaft pulling down on the operational latch. (The power to operate each of the operational functions is taken from an operational latch. A detailed description of each operational function, starting at the operational latch, can be found in its respective section of this manual.) The operational cam follower also contacts the interposer restoring lever and causes it to restore the operational interposer forward, allowing the interposer latch to relatch on the interposer latch plate.

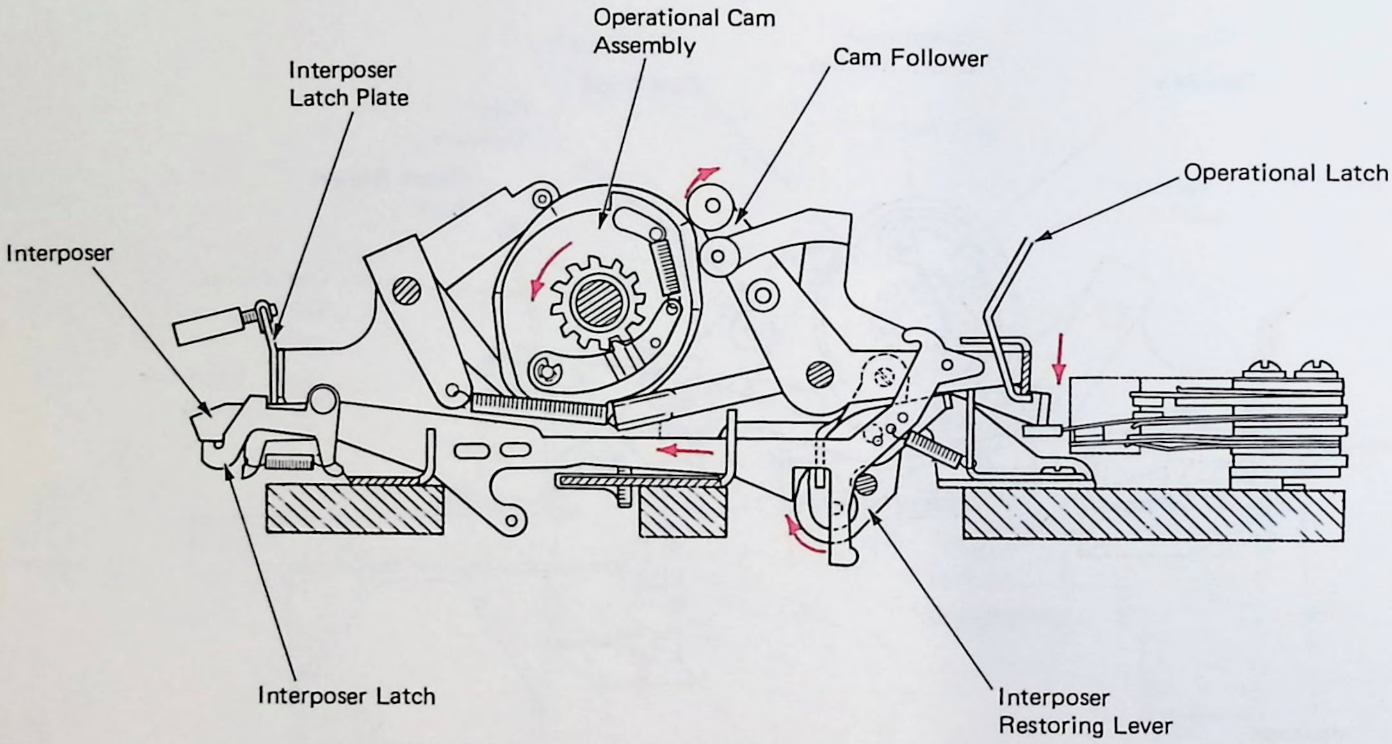
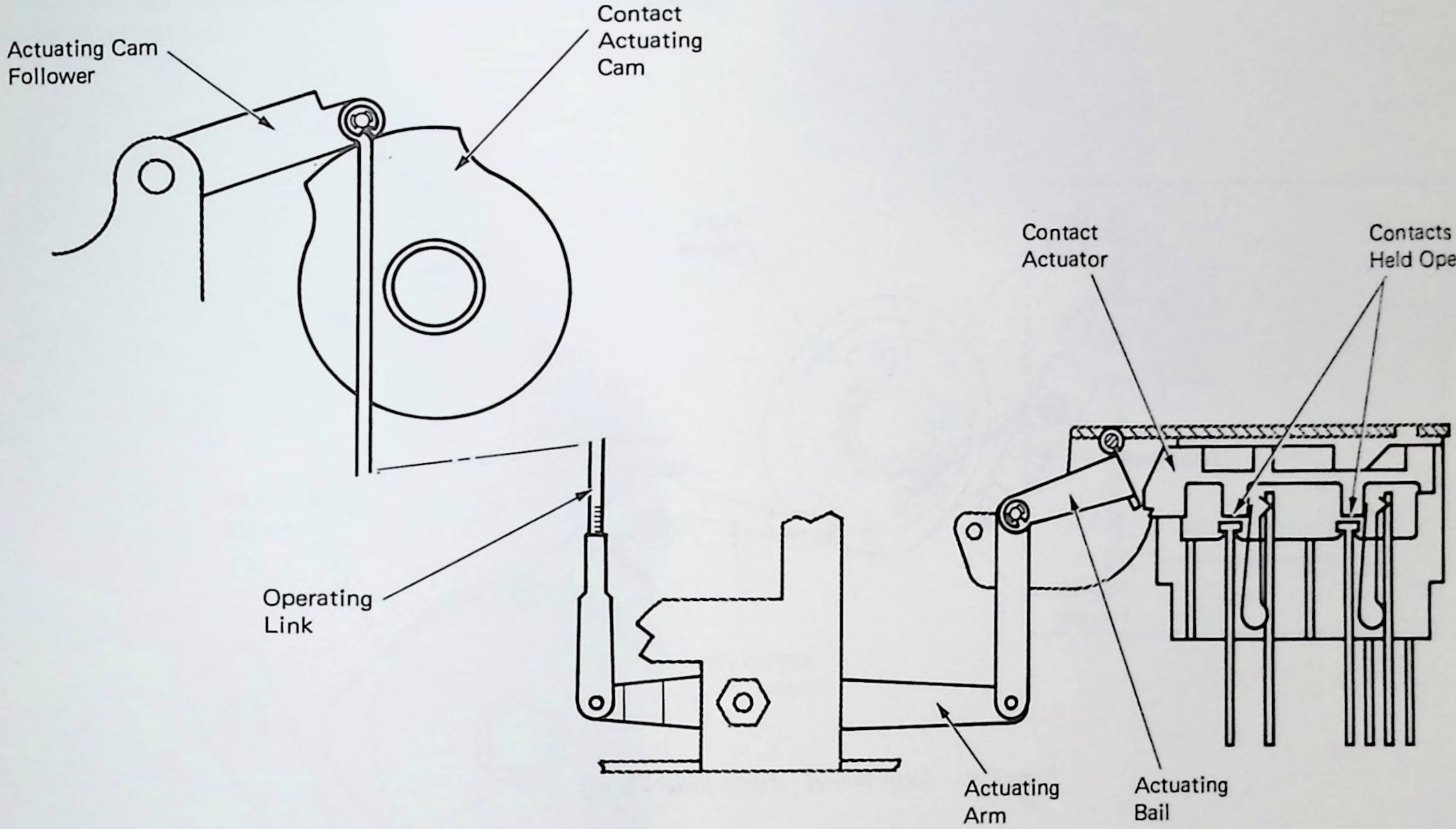


Figure 4 – Operational Cam (Operated) (Right Side View)

2. A contact actuating cam is mounted on the side of each operational cam. Whenever an operational cam rotates, the contact actuating cam also turns (Figure 5). At rest, the actuating cam followers are at the high point of the actuating cams. As the operational cam begins to turn, the actuating cam follower will travel to the low point of the actuating cam. The operating link will move down causing the rear of the actuating arm to move up. This will pivot the actuating bail away from the transmit contact assembly and allow the unlatched transmit contact actuator to move forward allowing the contacts to make.

The only transmit contact that transfers is the one that was unlatched when its corresponding operational interposer was activated. The other transmit contacts will be held open by their respective latches.



(Level 2 – At Rest)

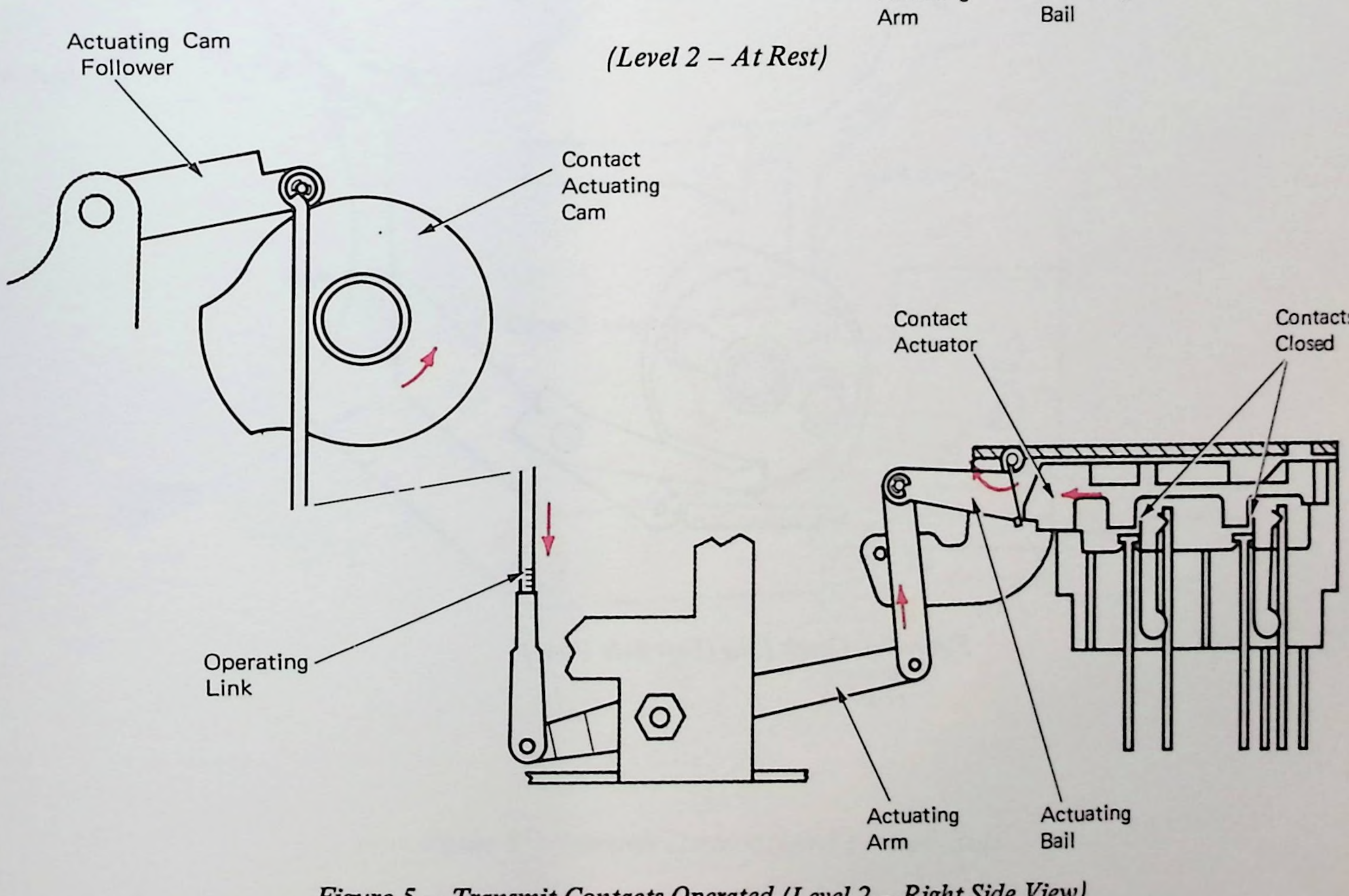


Figure 5 – Transmit Contacts Operated (Level 2 – Right Side View)

CHECK RING

As the operational cam completes its rotation, the cam wheel contacts the clutch release arm which pivots the cam pawl out of the operational ratchet (Figure 6). Continued rotation of the cam allows the check pawl to engage a notch in the check ring which is mounted on the opposite side of the cam (Figure 7). The check pawl holds the cam in its rest position ensuring that the cam pawl does not re-engage the operational ratchet until the next operation.

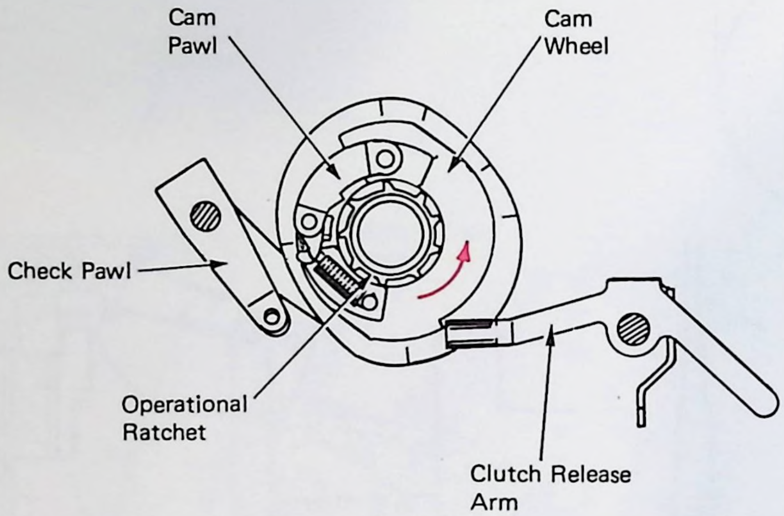


Figure 6 – Cam Wheel (Right Side View)

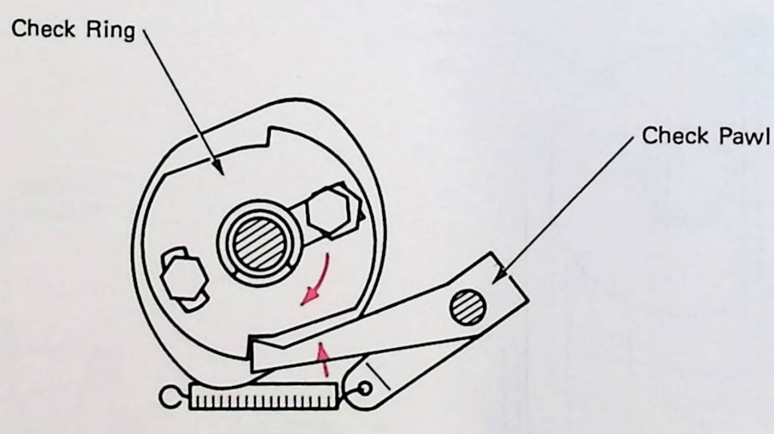


Figure 7 – Check Ring (Left Side View)

LEVEL 1 TRANSMIT CONTACTS

The level 1 operational transmit contacts are operated by an actuator arm (Figure 8). When the operational cam assembly turns the check pawl pivots out of the check ring notch. This motion pivots the actuator arm which in turn moves up away from the tops of the transmit contacts allowing the unlatched contact to transfer. When the cam approaches the end of its cycle, the check pawl drops back into its notch. This causes the actuating arm to pivot downward at the rear opening the transmit contact and allowing the latch to restore.

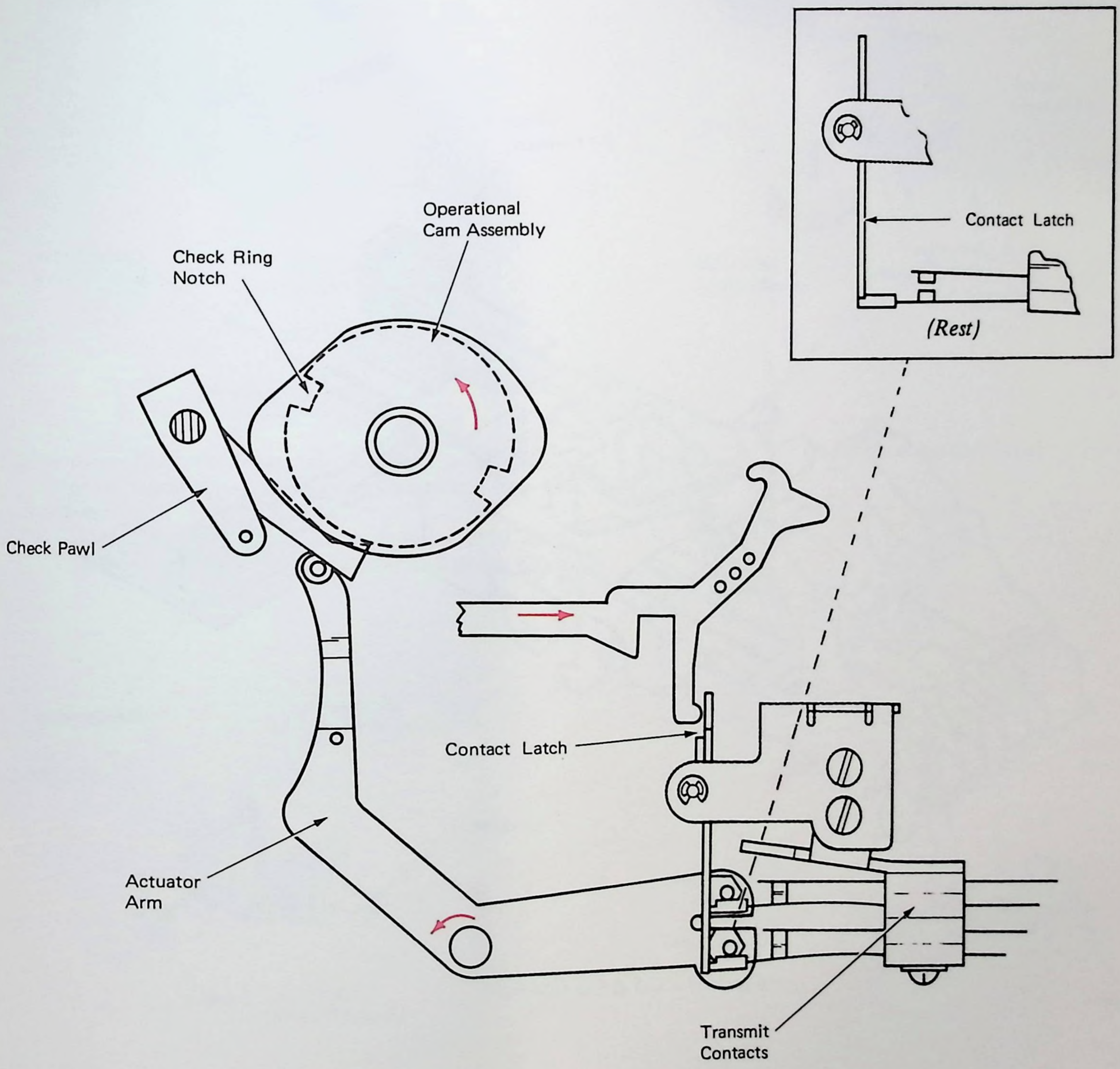


Figure 8 – Transmit Contacts (Level 1 – Operated)

C-5 & C-6 CONTACTS

The C5 and C6 contacts are also operated during their respective cam cycles. The C5 contact is operated by an auxiliary cam follower each time a spacebar, backspace or tab operation occurs. The C6 contact is operated by an extension on the carrier return cam follower (Figure 9).

These contacts provide the necessary gating for both input and output operation. During input to the interface, the make of the normally open (N/O) point is timed to ensure that the operational transmit contacts have been transferred, and can provide an indication to the interface of what function is in process. During output, these contacts provide gating for subsequent cycles permitting maximum operating speed.

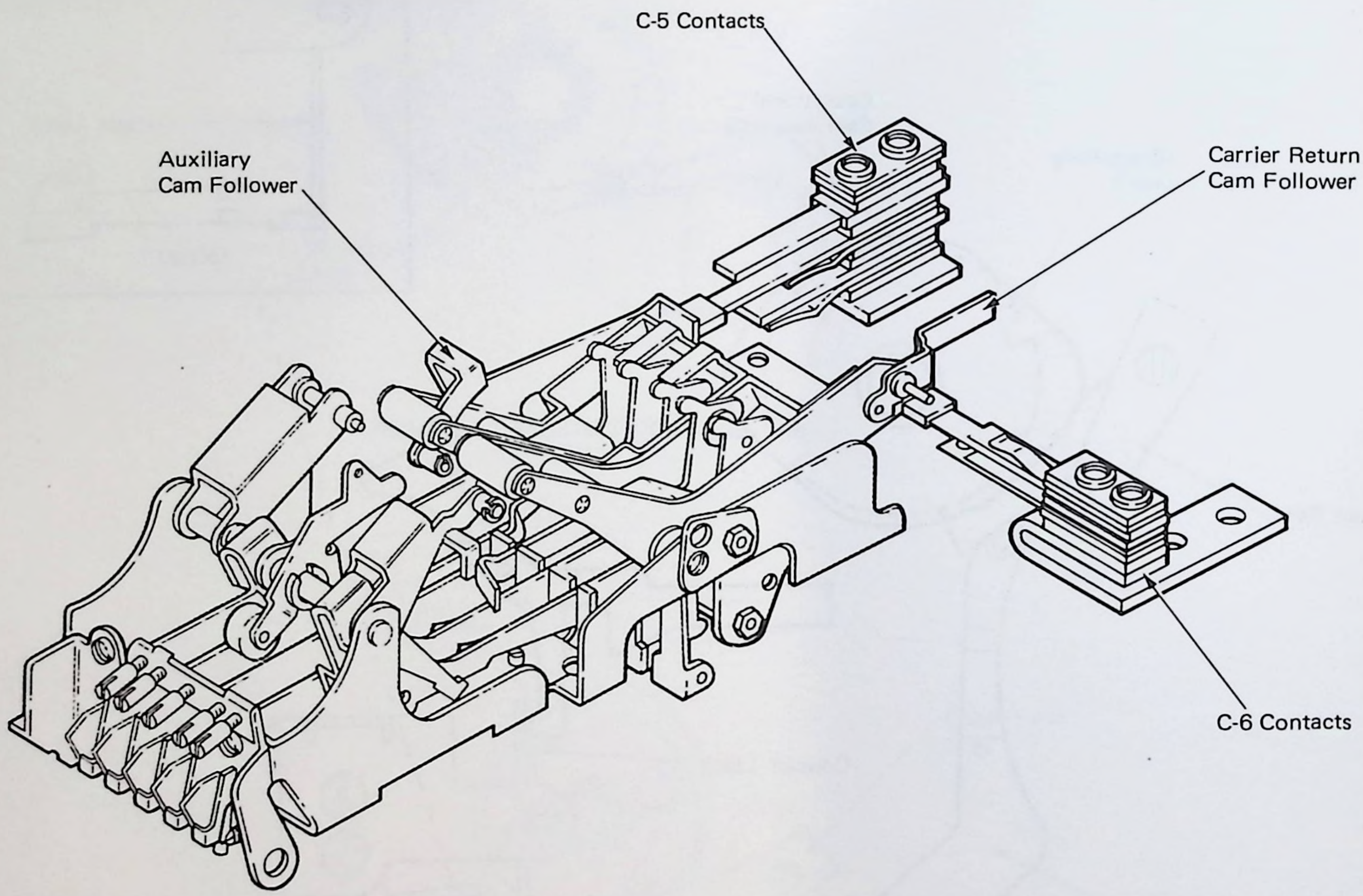
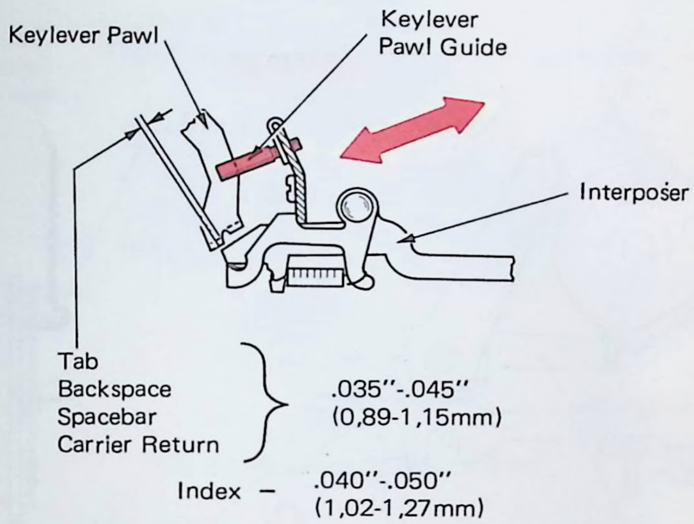


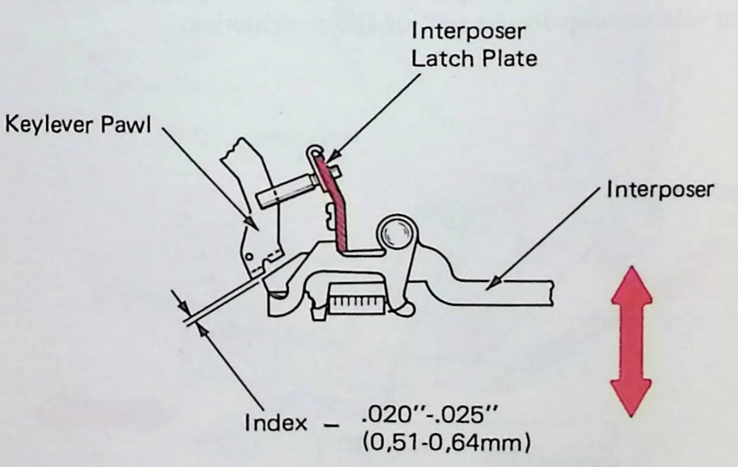
Figure 9 – C-5 & C-6 Contacts

1. *Keylever Pawl Overlap* – Adjust each keylever pawl guide so the keylever pawls overlap their respective interposers by .035"-.045" with both parts at rest. The index keylever pawl guide should be adjusted for .040"-.050" overlap. This overlap ensures proper repeat/non-repeat operation.



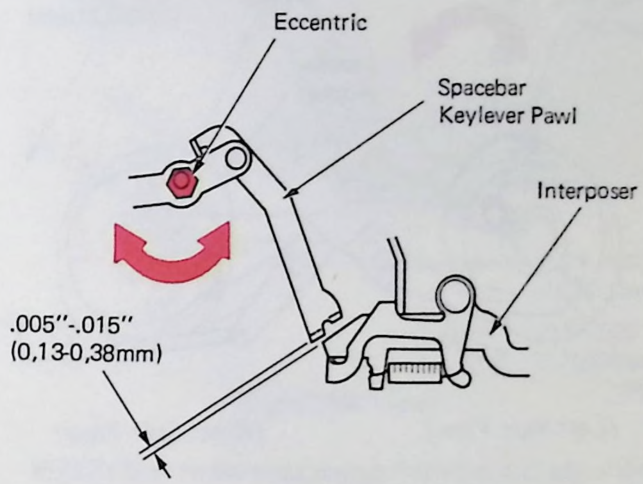
(Right Side View)

2. *Keylever Pawl To Interposer Clearance* – Adjust the keylever pawls up and down to obtain the following clearances:
   a. Adjust the interposer latch plate for .020"-.025" between the index keylever pawl and its interposer.

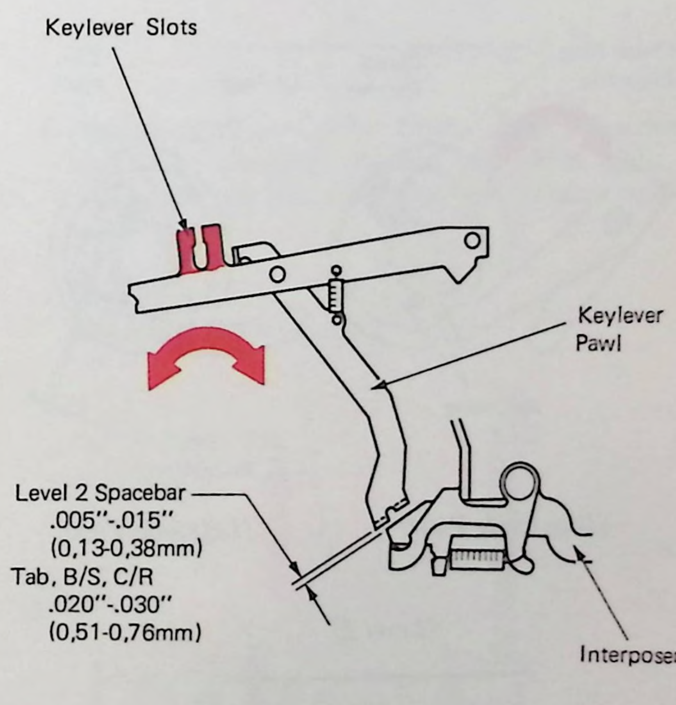


(Right Side View)

   b. Adjust the Level 1 spacebar keylever with the eccentric for a clearance of .005"-.015" between the keylever pawl and the interposer. Adjust the Level 2 spacebar keylever adjusting slots for .005"-.015" clearance between the keylever pawl and the interposer.
   c. Adjust the tab, B/S and C/R keylever slots for a clearance of .020"-.030" clearance between the keylever pawls and the interposers.



(Level 1 – Right Side View)

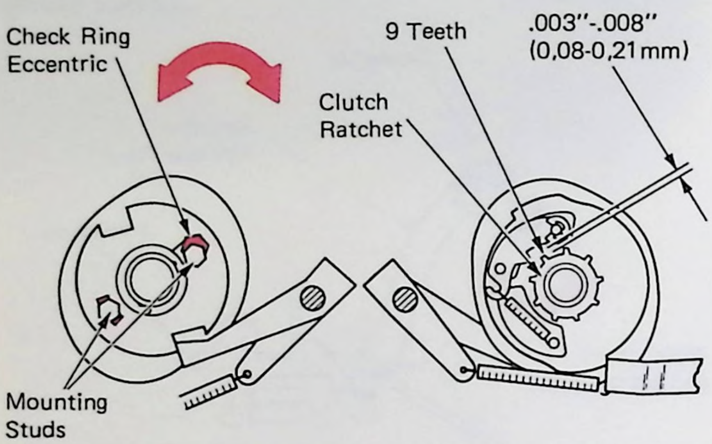


(Right Side View)

3. *Operational Cam Check Ring (Level 1)* – Adjust the operational cam check ring eccentric so that .003"-.008" exists between the tip of the cam pawl and the teeth of the operational cam ratchet with the cam latched in the rest position (9 tooth ratchet).

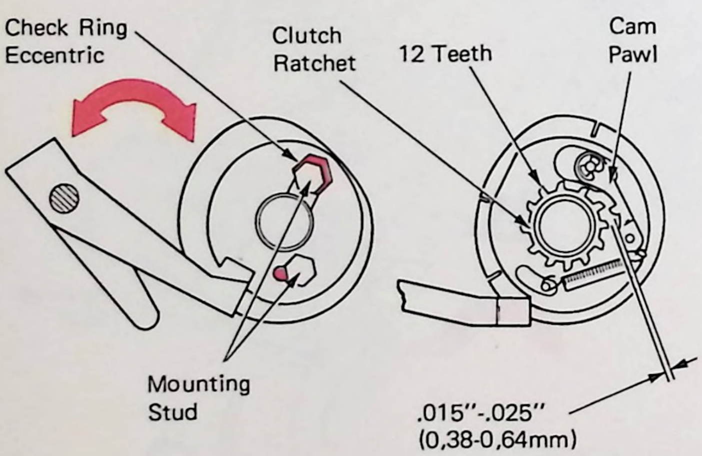
The level 2 cam should have .015"-.025" clearance (12 tooth ratchet).

NOTE: Both the check ring mounting studs must be loosened before making this adjustment.



(Left Side View) *(Right Side View)*

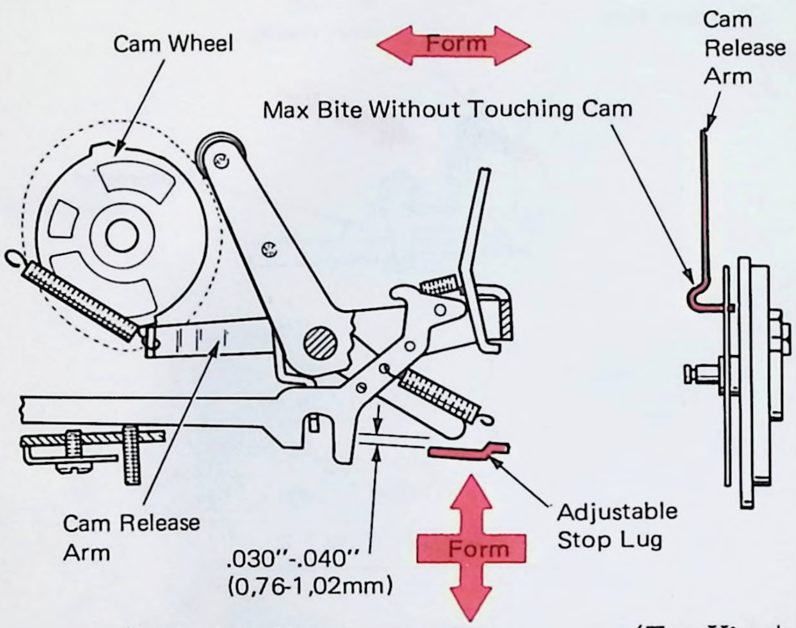
(Level 1)



(Right Side View) *(Left Side View)*

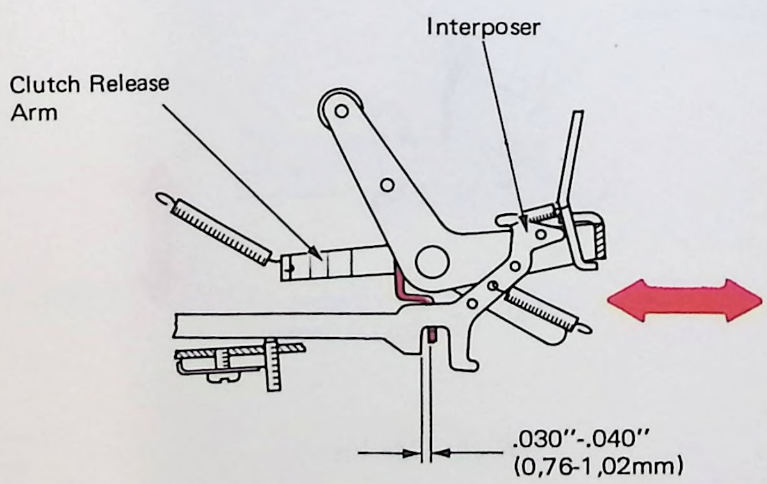
(Level 2)

4. *Clutch Release Arm Bite* – Form the adjustable stop lugs on the operational control bracket so each clutch release arm engages its cam wheel by .030"-.040". This adjustment may be observed by measuring the amount of clearance that exists between the stop lugs and the lower extension of each clutch release arm when the release arm has released the clutch wheel and is resting against the high portion of the clutch wheel tooth. On long machines (7 X 5), the operational cam assembly should be positioned left to right so that the clutch release arm for both the single and double lobed cams will take an equal lateral bite on its respective clutch wheel.



(Right Side View) *(Top View)*

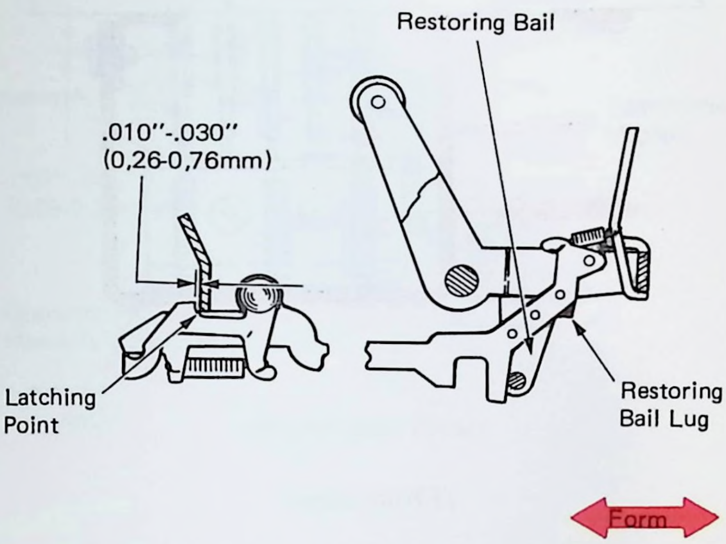
5. *Clutch Release Arms* – With the operational interposers and operational cams in their rest position, form the lug at the bottom of each clutch release arm so it clears the operational interposer lugs by .030"-.040". This adjustment ensures the proper timing of the operational cam in relationship to the rest of the mechanism.



(Right Side View)

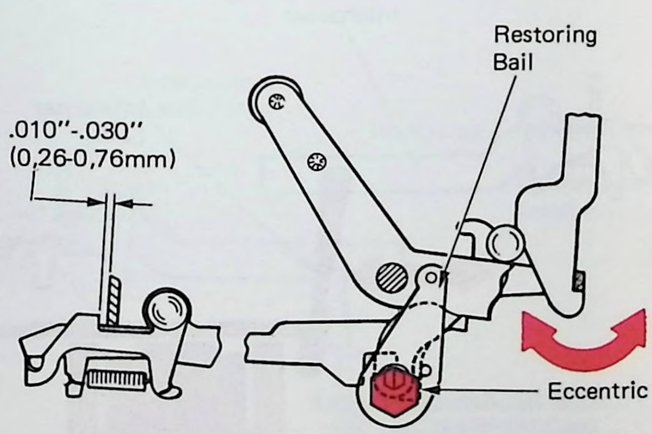
6. *Interposer Restoring Bail* – With the cam follower on the high point of the cam, adjust the restoring bail to over restore the interposers by a clearance of .010"-.030".

Level 1 – This adjustment is made by forming the restoring bail lug.



(Level 1 – Right Side View)

Level 2 – This adjustment is made with eccentrics located on either side of the bail.

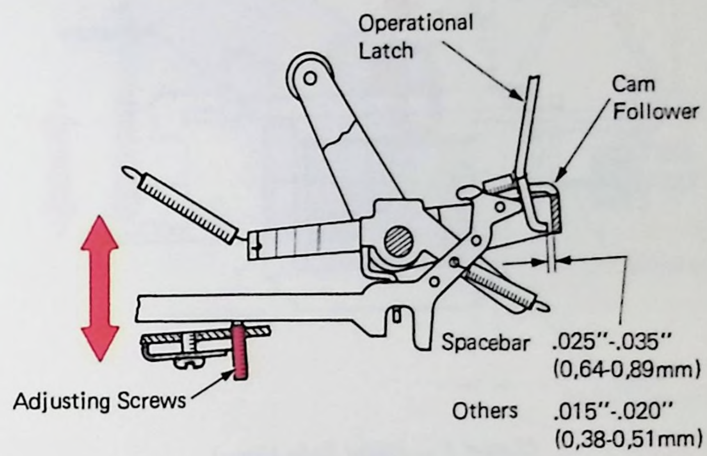


(Level 2 – Right Side View)

---

7. *Interposer Adjusting Screws* – Adjust the spacebar interposer adjusting screw so a front to rear clearance of .025"-.035" exists between the spacebar operational latch and the cam follower. All other latches should have .015"-.020" clearance with their respective cam followers.

This adjustment may be checked by operating the operational cams enough to move the cam followers down slightly at the rear. With the machine on its back, the latches can be pushed against the cam followers to estimate the clearance.

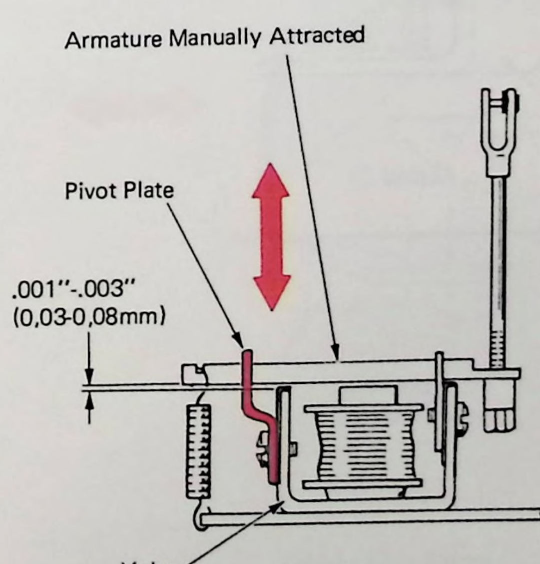


(Right Side View)

NOTE: Due to the relationship between this adjustment and the operational latch height adjustment of the Backspace, Carrier Return and Spacebar & Tab mechanisms, this adjustment must be rechecked after making the latch height adjustment.

---

8. *Operational Magnet Pivot Plate* – With the armature manually attracted, position the pivot plate for .001"-.003" clearance between the armature and the yoke.

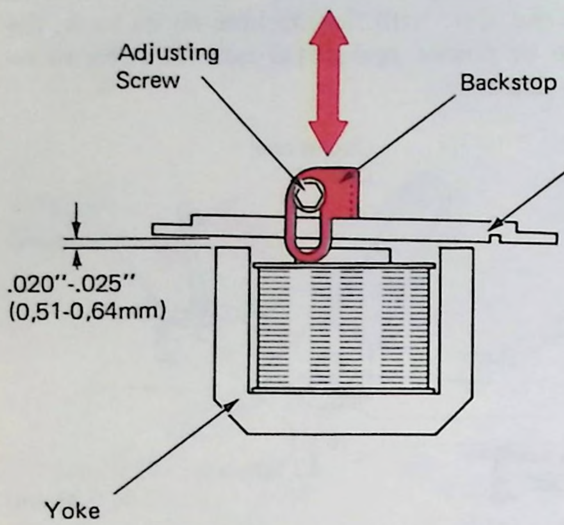


(Left Side View)

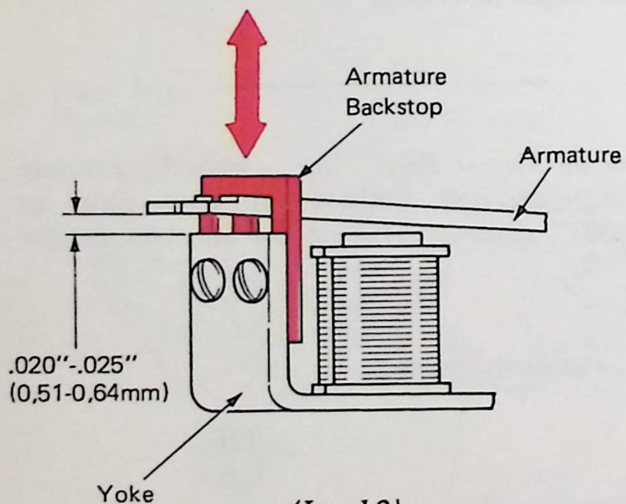
---

9. *Armature Backstop* – Position (armatures at rest) so that the armatures clear their yokes by .020"-.025".

This adjustment provides sufficient motion to unlatch the interposers and also ensures the armatures will be attracted by the magnet coils when they are energized.



(Level 1 – Right Side View)

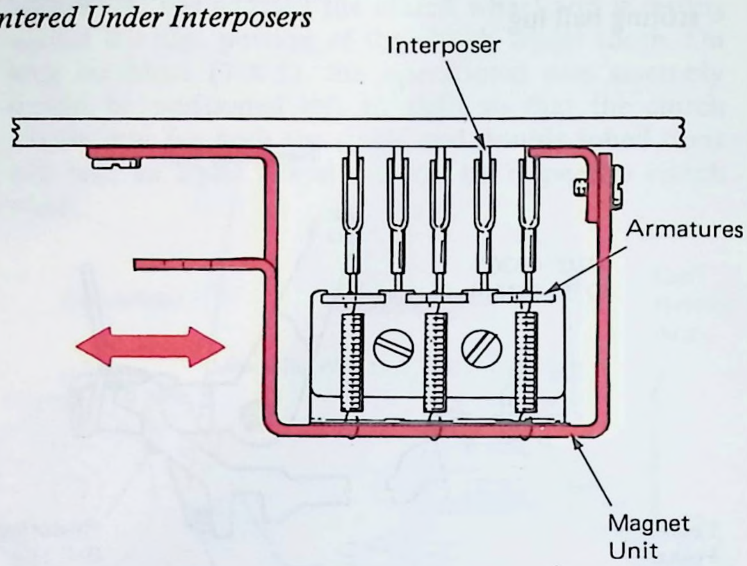


(Level 2)

---

10. *Magnet Unit* – Position as follows:
    a. Left to Right – so that the armatures are directly beneath their corresponding interposers.

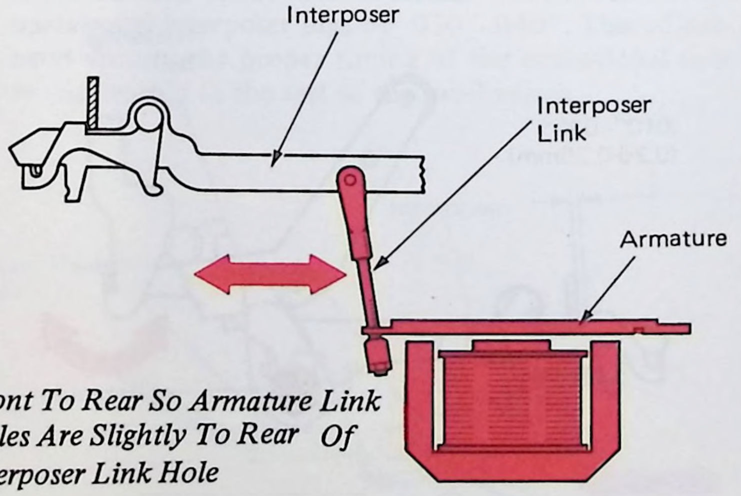
Left To Right So Armatures Centered Under Interposers



(Front View)

    b. Front to Rear – so that the armature link holes are slightly to the rear of the interposer link holes.

Having the interposer link offset ensures unlatching of the interposer since the link pulls downward and also to the rear.

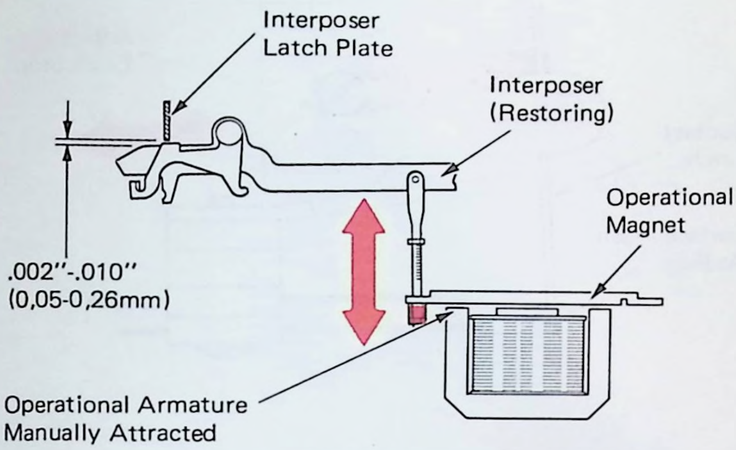


Front To Rear So Armature Link Holes Are Slightly To Rear Of Interposer Link Hole

(Right Side View)

---

11. Interposer Link – Adjust the operational interposer links so that a .002"-.010" clearance exists between the interposer latch plate and the interposer latch at the point of relatching with the armature manually attracted.

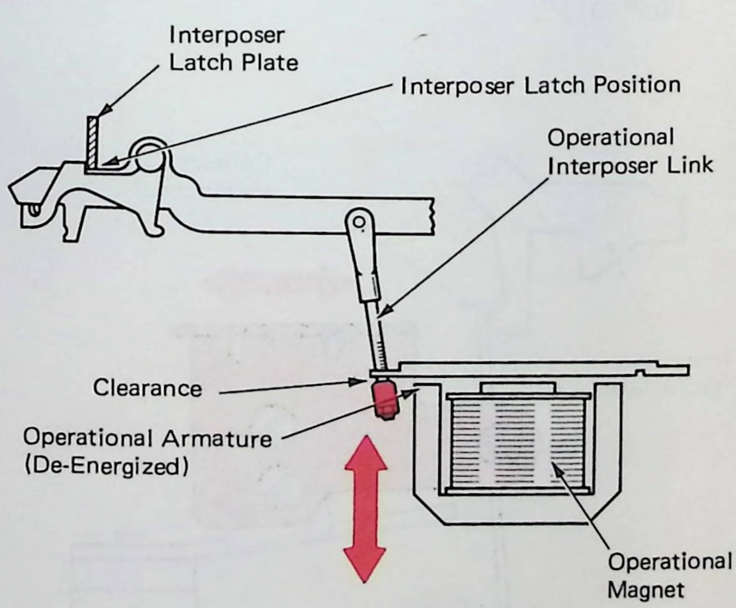


(Right Side View)

NOTE: Test this adjustment by manually attracting the armature and turning the operational shaft so that the interposer is being restored toward the front.

With all parts at rest be sure a clearance exists between the pull link and the armature.

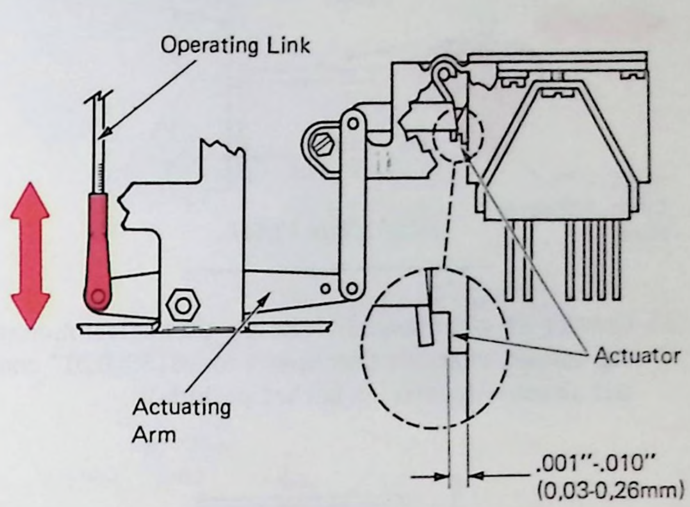
The pull link must be approximately 1/2 turn too long to ensure that the armature is moving prior to picking up the load of the interposer. An interposer link adjusted too short can cause an intermittent operation or complete failure to release.



(Right Side View)

---

12. Operating Link (Level 2) – Adjust the links (with the cams latched at rest) so that the contact actuators will have .001"-.010" travel before bottoming. This can be checked by pulling on the actuating arm and observing .001"-.010" motion of the actuator as shown.

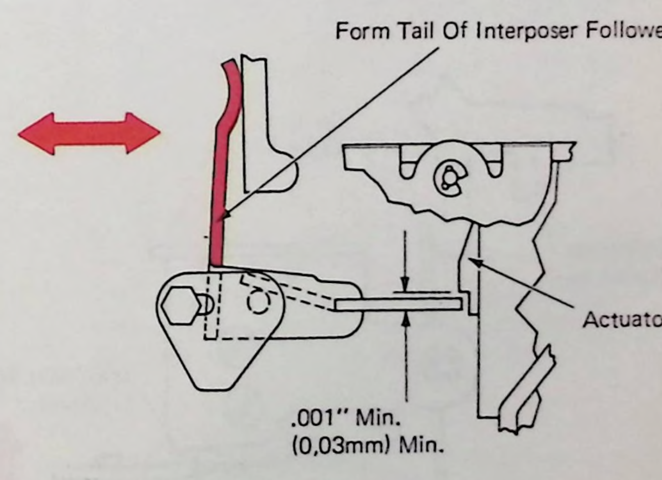


(Right Side View)

---

13. Contact Latches (Level 2) – Form the tails of the interposer followers so that the latches will clear the step on the actuator by .001" minimum with the interposers latched.

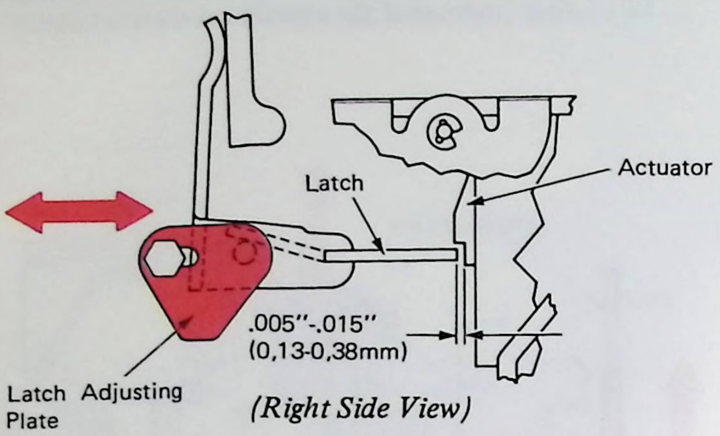
NOTE: The bottom of the latches should not be below the bottom of the actuator.



(Right Side View)

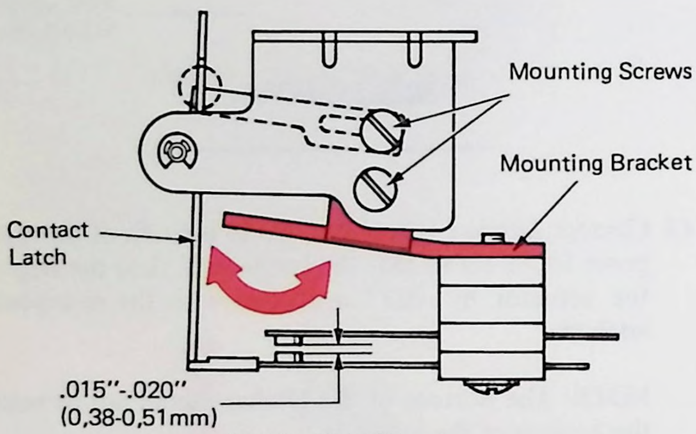
---

14. *Adjusting Plates (Level 2)* – The actuator latch adjusting plates should be adjusted so that the actuator latches clear the rise on the actuator by .005"-.015" (With the operational cams latches at rest).



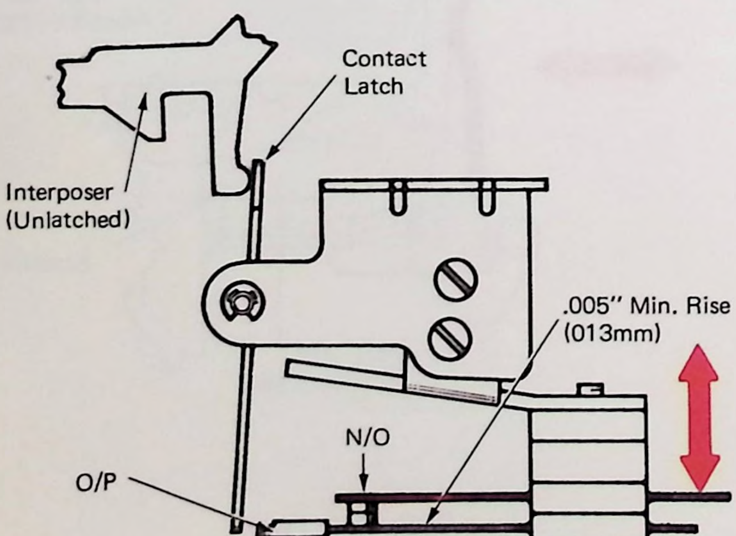
(Right Side View)

15. *Contact Air Gap (Level 1)* – Rotate the contact mounting bracket under its four screws for .015"-.020" contact air gap – (contact in latched position).



(Right Side View)

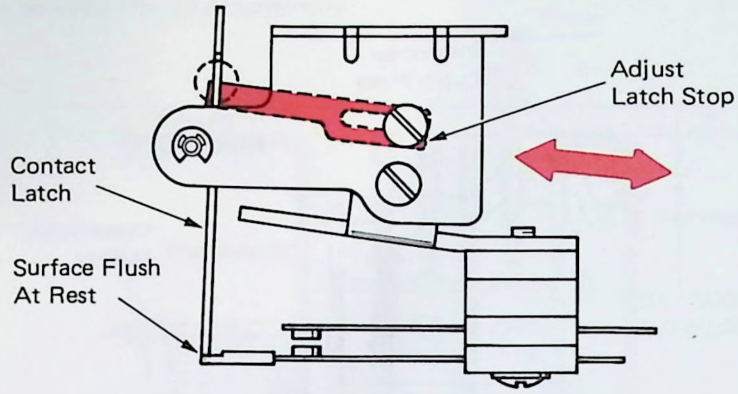
16. *Normally Open Contact Rise (Level 1)* – With the contacts unlatched, form the N/O straps for .005" minimum rise.

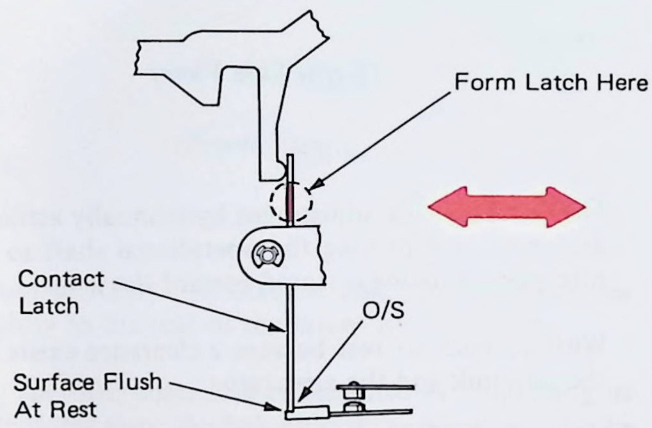


(Level 1)

(Right Side View)

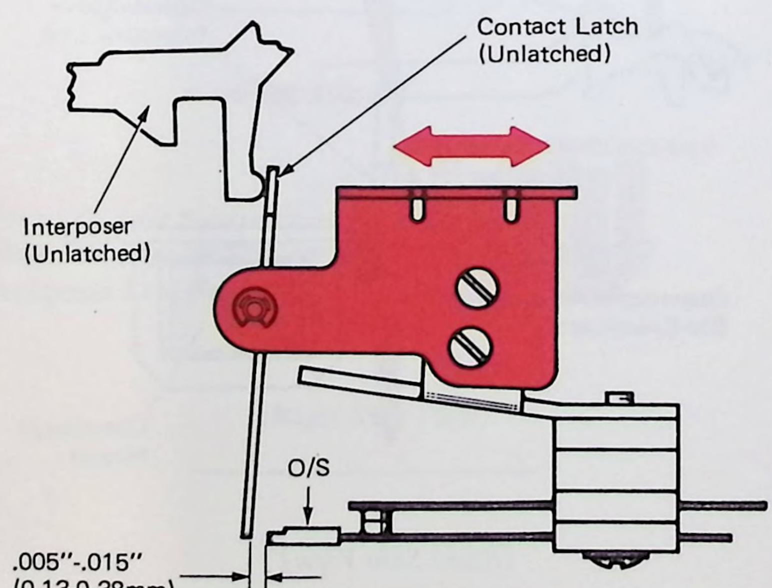
17. *Contact Latches (Level 1)* – Adjust the latch stop to position the contact latches flush with the end of the O/S. On machines without the latch stop, form the contact latch.





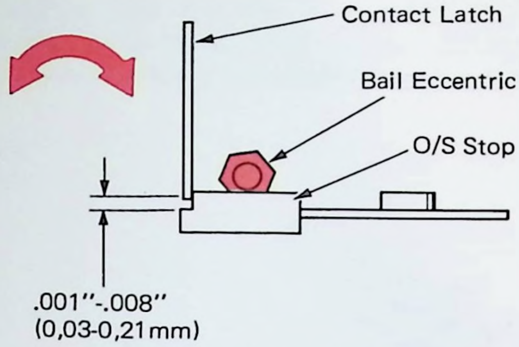
(Level 1 – Right Side View)

18. *Contact Assembly Position (Level 1)* – With the operational interposer unlatched, position the contact assembly front to rear so that the latches clear the O/S by .005"-.015".



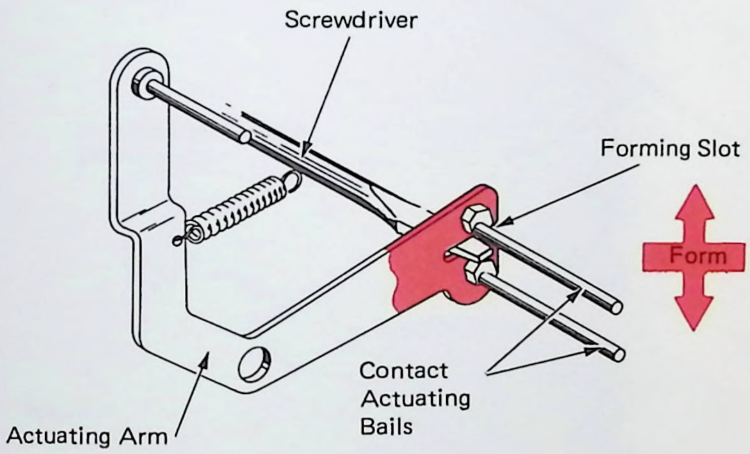
(Right Side View)

19. *Bail Eccentrics (Level 1)* – With the operational functions at rest, adjust the bail eccentrics to provide a clearance of .001"-.008" between the contact latch and the O/S stop.

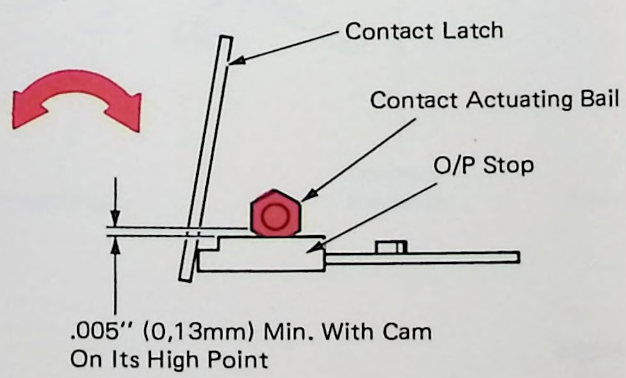


(Right Side View)

NOTE: When a bail actuates more than one contact, form the actuating arm slot to provide equal latch to contact clearances.



With the operational cams on their high points, the actuating bails should clear the O/P stops by a minimum of .005". This ensures the operational contacts will reliably make.



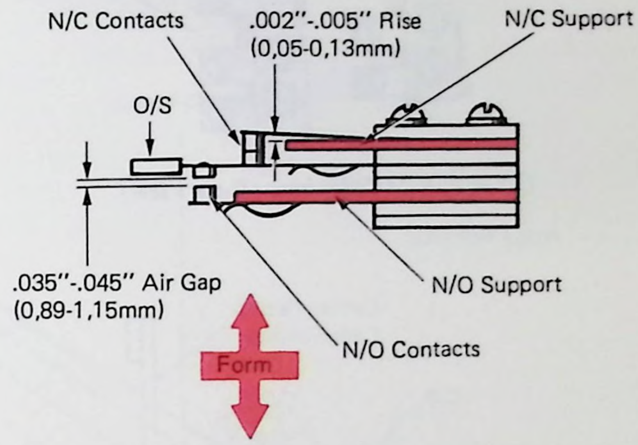
(Right Side View)

20. *C5 and C6 Contact Supports* – Adjust for the following conditions:

a. Form the N/C supports so that the O/S's lift the N/C contacts .002"-.005".

   Form the N/O supports for .035"-.045" air gap between the O/S and N/O contacts.

   NOTE: .035"-.045" air gap may have to be altered to obtain timing.

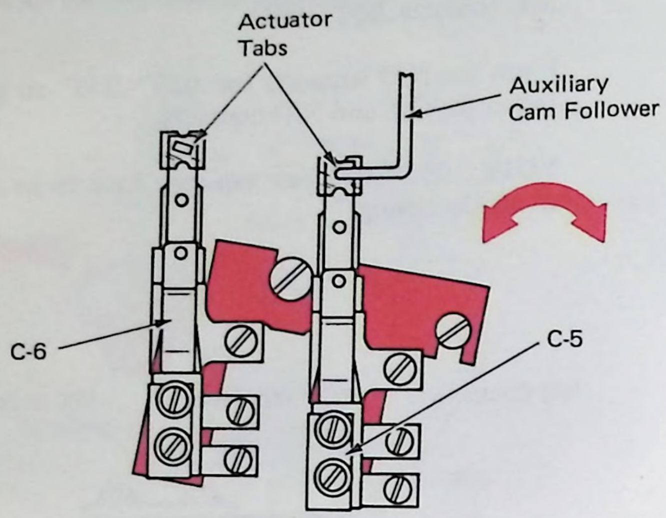


b. Adjust the contacts and their mounting brackets up or down for the make and break times indicated.

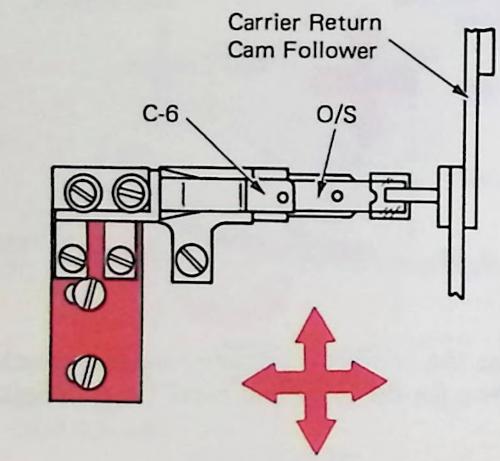
	C-5 N/O		C-6 N/O	
Machine	Make	Break	Make	Break
731	55° ±5	130° ±5	170° ±5	305° ±5
735	55° ±5	130° ±5	170° ±5	305° ±5
775 (MT/ST)	55° ±5	130° ±5	170° ±5	305° ±5
655 (MT/SR)	65° ±5	125 ° ±5	170° ±5	305° ±5

C-5 Transfer Time Is 10° to 20° Measured On The Rise Side Of The Cam C-6 Transfer Time Is 20° to 40° Measured On The Rise Side Of The Cam.

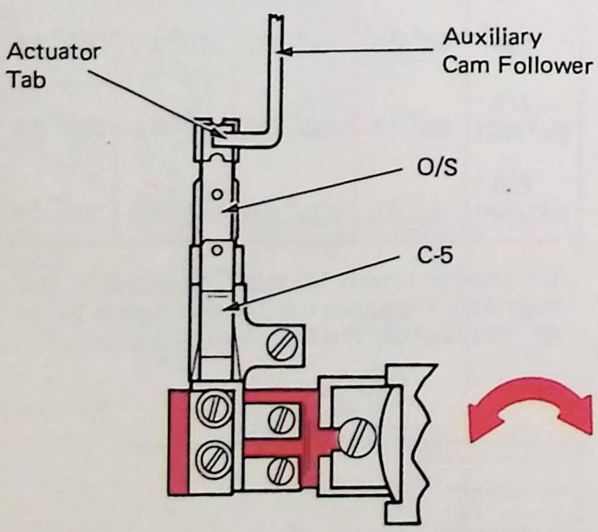
21. *C5 and C6 Contact Position* – Position the contact assemblies so their O/S's are centered under their actuator tabs.



C-5 & C-6 11" Machine (Rear View)



C-6 15" Machine (Top View)



C-5 15" Machine (Top View)

The purpose of the spacebar mechanism is to provide a means of moving the carrier to the right one space at a time without printing. Operation of the spacebar is possible from the keyboard or from some remote source through the use of magnets. The spacebar is mounted at the front of the keyboard on a pivot shaft (Figure 1). Depression of the spacebar causes the pivot shaft to rotate, and in turn rotates the spacebar keylever. As the spacebar is depressed, a lower lug of the keylever pawl contacts the operational interposer.

When the operational interposer is released, it releases the S/B, B/S, tab cam and positions the spacebar latch under the rear of the cam follower. The theory of operation for the entire operational control mechanism is covered in that section of this manual.

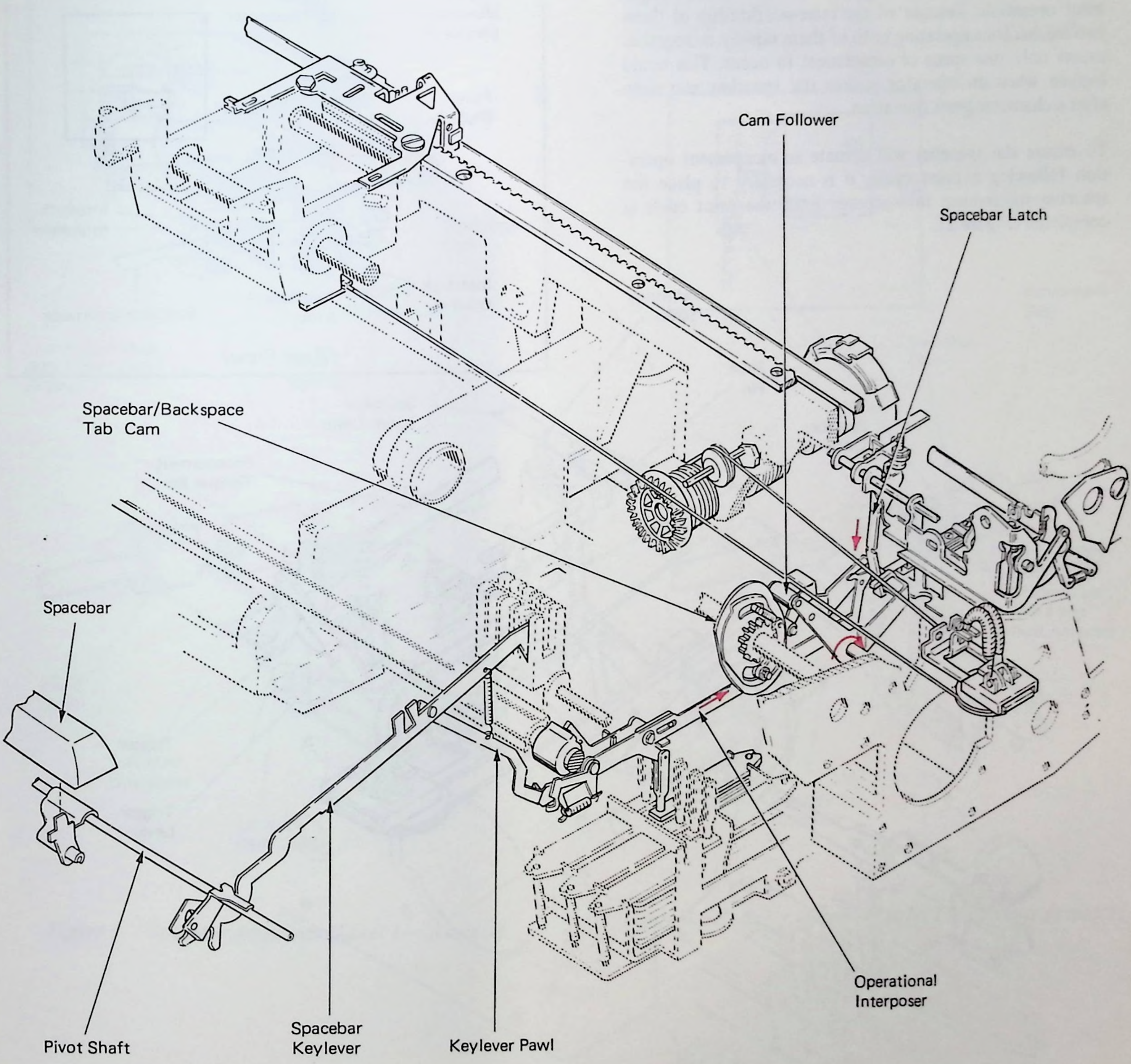


Figure 1 – Spacebar Mechanism

SPACEBAR OPERATION

Movement of the cam follower pulls the spacebar latch down which causes the spacebar latch lever to pivot (Figure 2). An adjusting screw on the latch lever contacts the trigger lever, causing the trigger lever to rotate about its pivot pin. This causes the trigger on the trigger lever to rotate the escapement torque bar and allow the carrier to complete an escapement operation in the same manner as a character print escapement.

PRINT-TO-SPACE INTERLOCK

Both spacebar escapement and print escapement operate by actuating the escapement trigger lever to cause an escapement operation. Because of the inter-relationship of these two mechanisms operating both of them rapidly or together causes only one space of escapement to occur. This could happen when an operator strikes the spacebar too soon after a character print operation.

To ensure the spacebar will actuate an escapement operation following a print cycle, it is necessary to place the spacebar mechanism into storage until the print cycle is completed (Figure 2).

Spacebar storage is accomplished by blocking the movement of the spacebar interposer to the rear. As the filter shaft rotates during a print operation, the interlock interposer follows the contour of the spacebar interlock cam and pivots top to the front. As the interlock interposer drops off of the high point of the cam, its rear extension moves up and blocks the movement of the interposer to the rear. This stops the spacebar operation and holds the interposer in "storage" until the print cycle is completed.

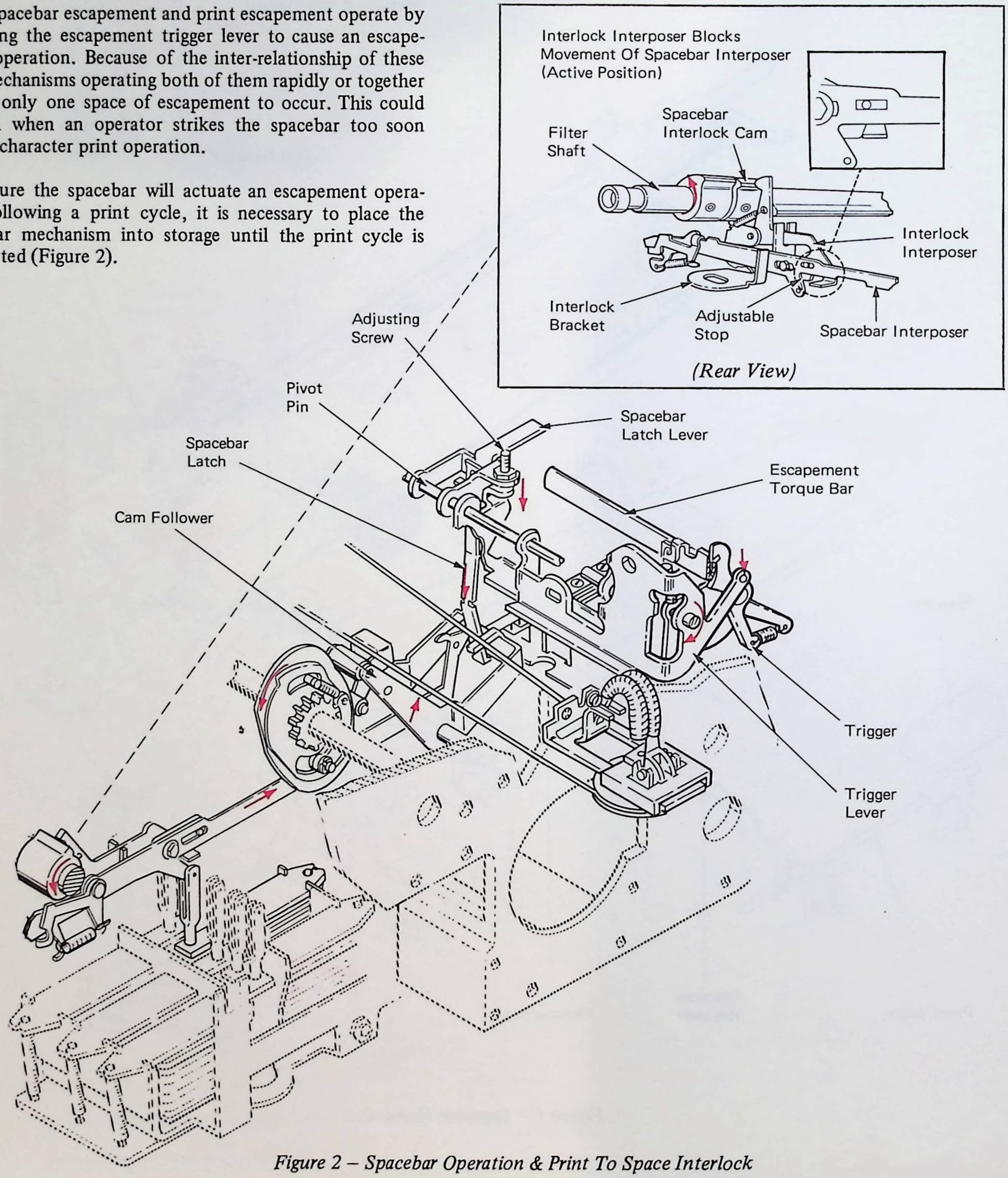


Figure 2 – Spacebar Operation & Print To Space Interlock

On Level 1 machines spacebar storage is accomplished differently (Figure 3). A lockout cam is spring-loaded toward the right against the escapement cam. In the rest position, the lockout cam is held to the left by the lateral camming surfaces of the two cams. In this position, the spacebar interposer is free to operate without interference.

During a character cycle, rotation of the filter shaft allows the lockout cam to move toward the right because the high points of the lateral camming surfaces are no longer in contact (Figure 4). The lockout cam is prevented from rotating with the filter shaft by a guide bracket that fits in a slot in the front of the cam. As the lockout cam slides to the right, an extension at the bottom of the cam moves into the path of a lug on the spacebar interposer. As the filter shaft approaches its rest position, the lockout cam is forced back to the left by the escapement cam. The spacebar interposer is then released and normal spacebar operations can occur.

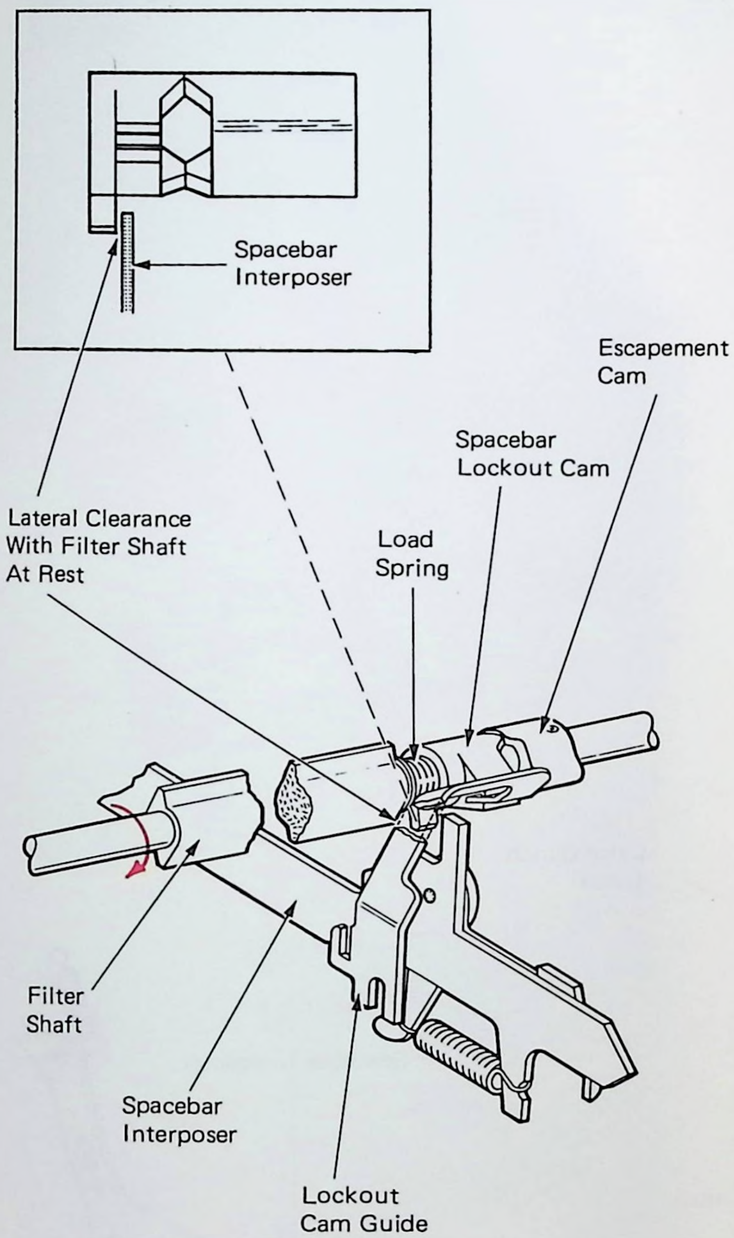


Figure 3 – Spacebar Interlock (Level 1 – At Rest)

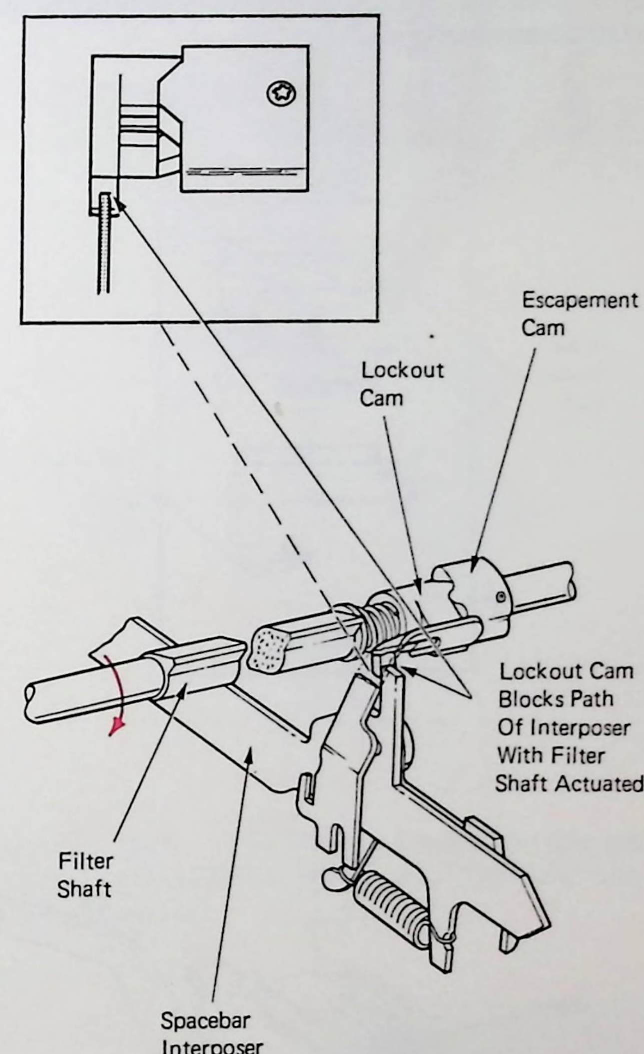


Figure 4 – Spacebar Interlock (Level 1 – Lockout Actuated)

The interlocks described above are called Print-to-Space interlocks. This is because the print cycles supersede the spacebar cycles. This type of interlock is necessary in case the operator initiates a spacebar cycle too soon after a character print cycle.

SPACE-TO-PRINT INTERLOCK

A second interlock called the Space-to-Print interlock does just the opposite. The space-to-print interlock is available for field installation in those cases where extremely fast typists initiate print cycles too soon after a spacebar cycle.

There are two levels of Space-to-Print interlocks. The parts design of these two levels is different but the principle of operation is basicly the same. A link attached to the spacebar interposer extends toward the front of the machine (Figure 5). This link is attached to an interlock bail. This bail is mounted between the right keyboard side frame and a plate attached to the cycle clutch latch bracket. When the spacebar interposer is tripped and moves to the rear, the link causes the interlock bail to rotate. An extension on the left end of the interlock bail rotates into the path of the cycle clutch link, blocking its forward movement and interrupting a print operation.

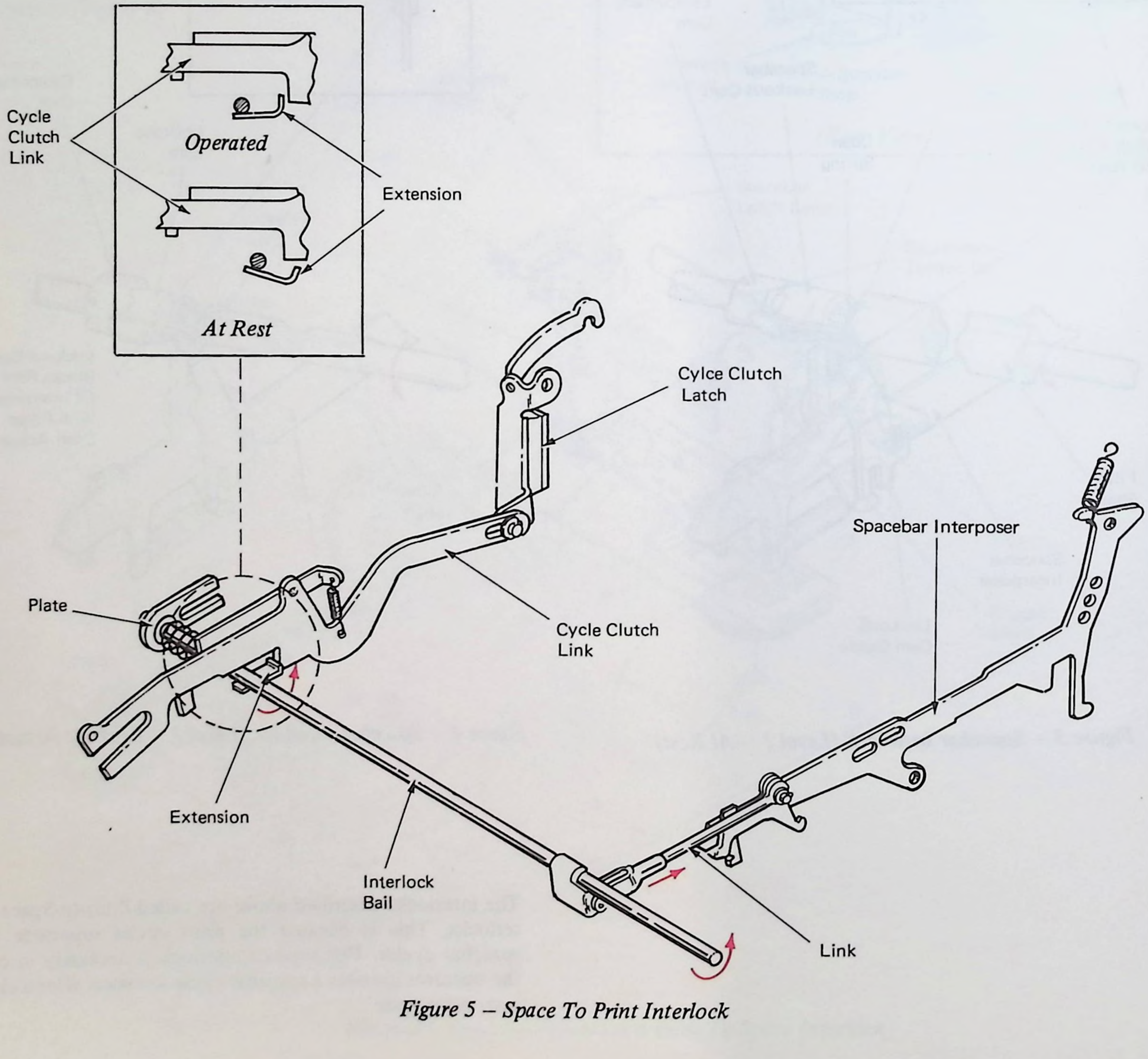


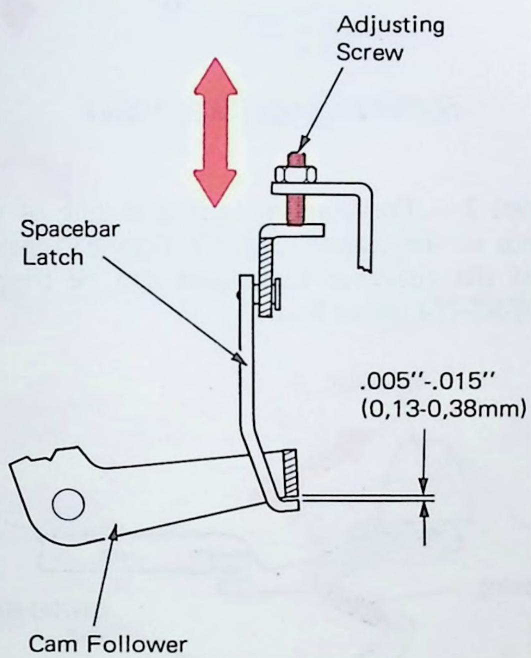
Figure 5 – Space To Print Interlock

SPACEBAR ADJUSTMENTS

NOTE: All operational control adjustments must be correct before attempting to make these adjustments.(See Operational Control Mechanism Section)

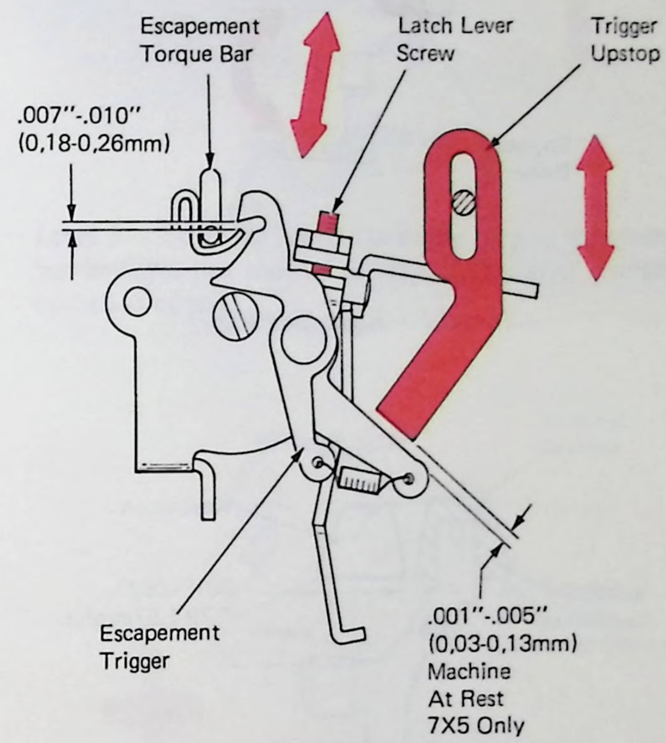
1. Operational Latch Height – Adjust the latch adjusting screw so the spacebar latch will pass under the cam follower with a clearance of .005"-.015".

   NOTE: This clearance can be observed by pulling the latch to the rear with a spring hook while the machine is at rest.



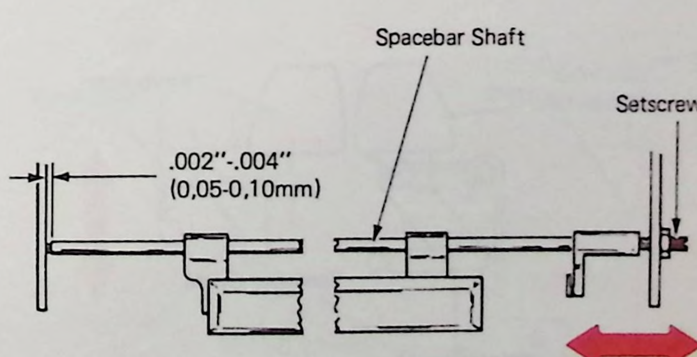
(Right Side View)

2. *Spacebar Latch Lever Screw* – Adjust the screw so that .007"-.010" clearance exists between the escapement trigger and the escapement torque bar. Disconnect the escapement trip link before making this adjustment. On 15" machines, the trigger upstop should be moved up out of the way when making this adjustment. After completing the adjustment, the upstop should be re-adjusted so it clears the trigger lever by .001"-.005".



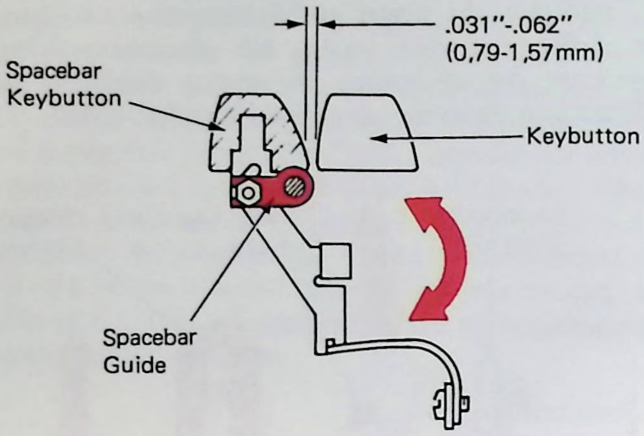
(Right Side View)

3. *Spacebar Shaft* – Adjust the set screw at the right end of the spacebar shaft so that there is .002"-.004" end-play of the shaft.

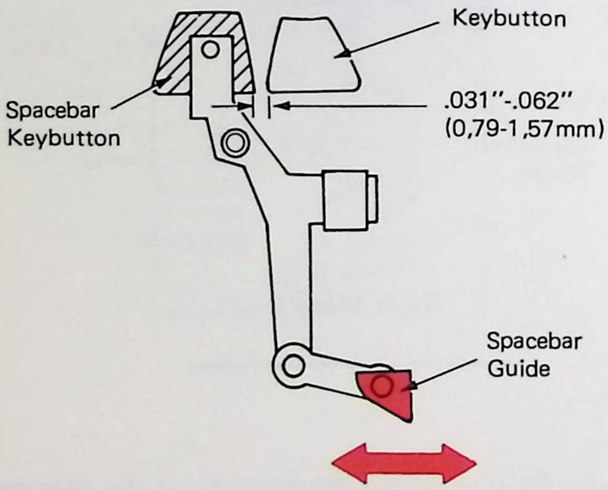


(Top View)

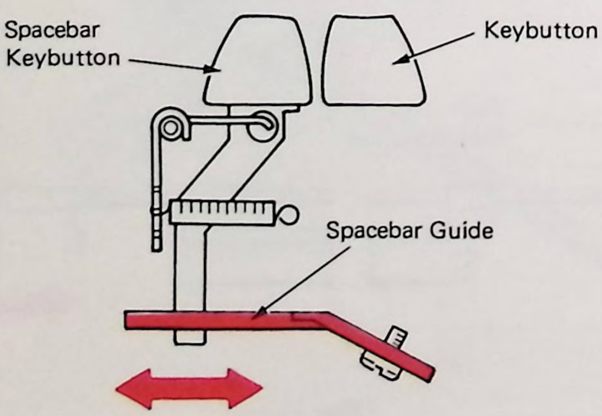
4. *Spacebar Guide* – Adjust the spacebar guide for free up and down travel of the spacebar keybutton and for .031"-.062" clearance between the rear edge of the spacebar keybutton and the front edge of the fourth row character keybuttons.



(Level 1 – Right Side View)



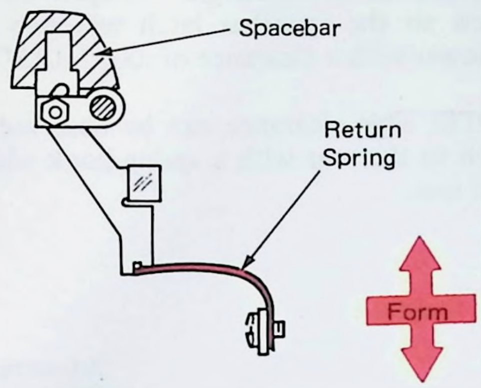
(Level 2 – Right Side View)



(Level 3 – Right Side View)

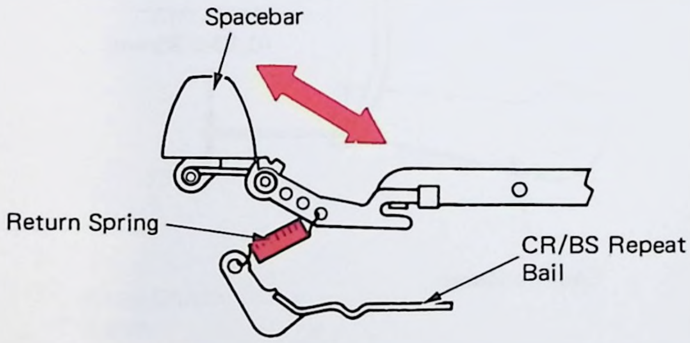
---

5. *Spacebar Return Spring* –
   a. Level 1 – The spring should be formed up or down so that a weight of 2-1/2 ounces will just fail to trip the spacebar interposer. The medium screwdriver, which weights 2-1/2 ounces, can be used for this check.



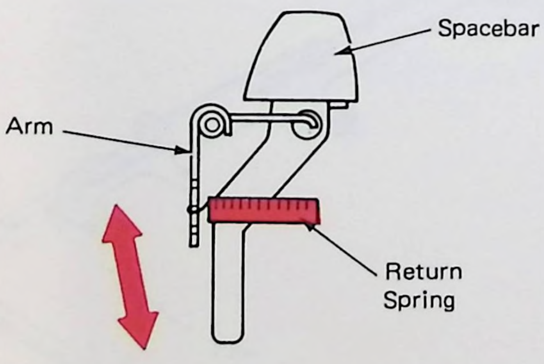
(Level 1 – Right Side View)

   b. Level 2 – Position the spring in one of the three holes in the carrier return/backspace repeat bail so that the spacebar interposer can be tripped by a 2-3/4-3-1/4 ounce load.



(Level 2 – Right Side View)

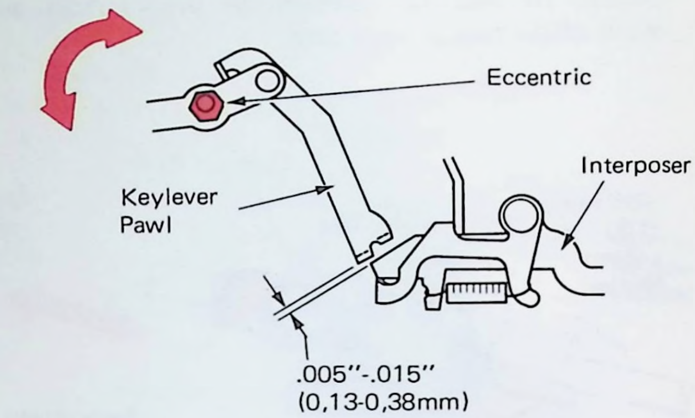
   c. Level 3 –Adjust the spring in the notch on the arm so the spacebar interposer can be tripped by a 3 3/4-3 1/4 ounce load.



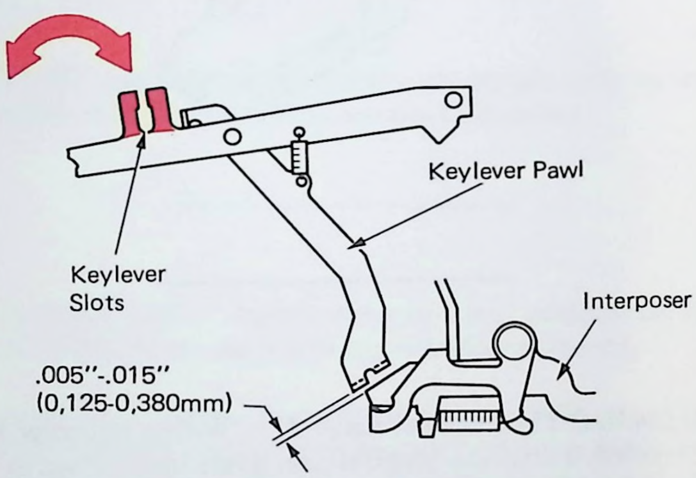
(Level 3 – Right Side View)

---

6. *Keylever Pawl To Interposer Clearance* – Adjust the eccentric on the spacebar keylever mounting stud on Level 1 machines, and the adjusting slots on Level 2 machines for .005"-.015" clearance between the keylever pawl and the spacebar interposer.



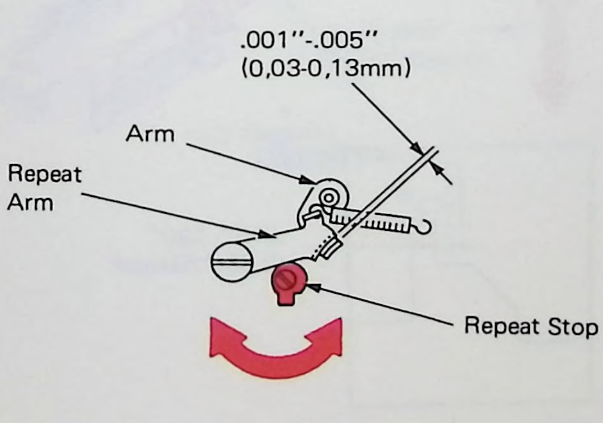
(Level 1 – Right Side View)



---

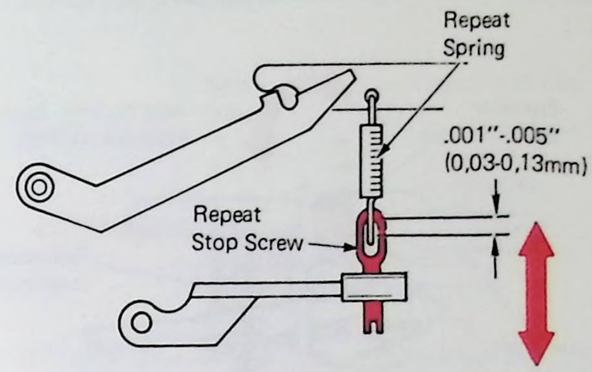
7. *Spacebar Repeat Stop* – The additional load of the repeat stop should be applied to the spacebar just after a single operation occurs. Adjust in the following manner:

Level 1 – Adjust the repeat stop rotationally for a clearance of .001"-.005" between the arm on the spacebar shaft and the repeat arm as a single operation just occurs.



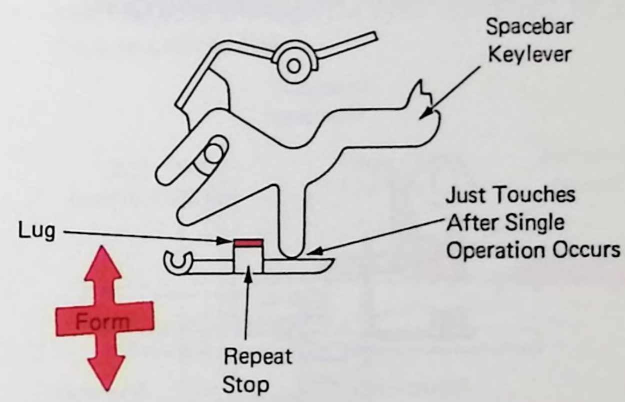
(Level 1 – Left Side View)

Level 2 – Adjust the repeat stop screw for a clearance of .001"-.005" between the repeat stop screw and the repeat spring as the single operation just occurs.



(Right Side View)

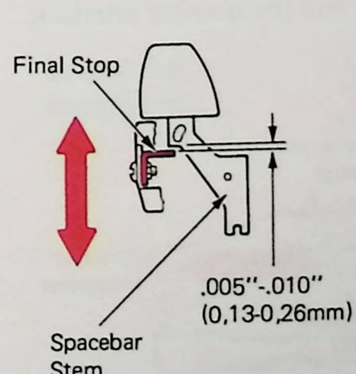
Level 3 – Form the lug on the repeat stop so the spacebar keylever just touches the repeat stop after a single operation occurs.



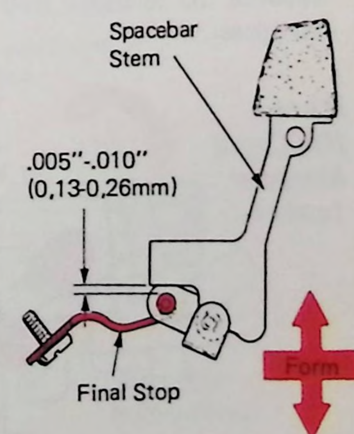
(Right Side View)

---

8. *Spacebar Final Stop* – Adjust the spacebar final stop to obtain .005"-.015" clearance between the stop and the spacebar stem at the time a repeat operation occurs.



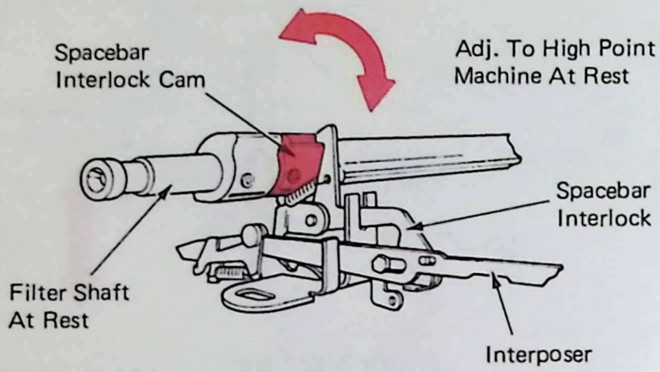
(Level 1 – Right Side View)



(Level 2 – Left Side View)

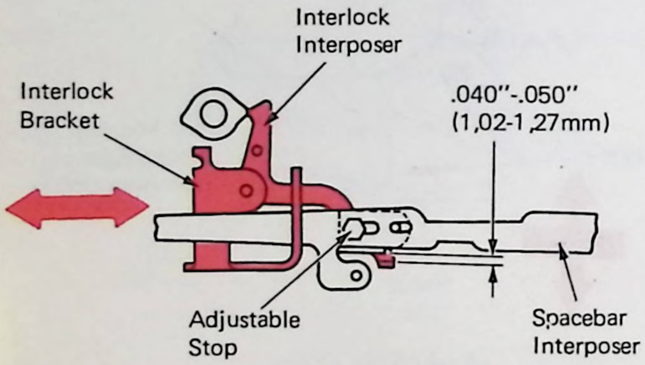
---

9. *Spacebar Interlock Cam (Level 2)* – Adjust the spacebar interlock cam radially on the filter shaft so that when the machine is at rest, the spacebar interlock interposer is on the high point of the cam.



---

10. *Spacebar Interlock Bracket (Level 2)* – With the machine at rest and the spacebar interposer released, adjust the interlock bracket front to rear to obtain a clearance of .040"-.050" between the interlock interposer and the adjustable stop on the spacebar interposer.

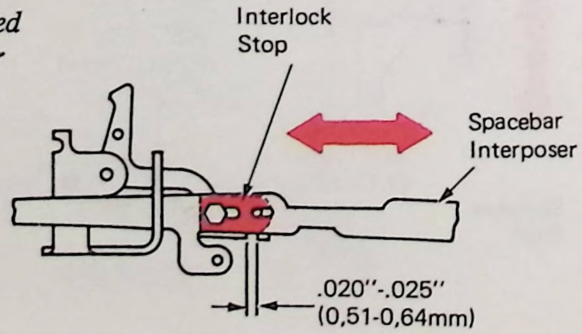


(Right Side View)

---

11. *Interlock Stop (Level 2)* – With the machine half cycled and the spacebar interposer latched at rest, adjust the interlock stop so there is .020"-.025" clearance between the interlock stop and the spacebar interlock interposer.

Machine Half Cycled Interposer Latched

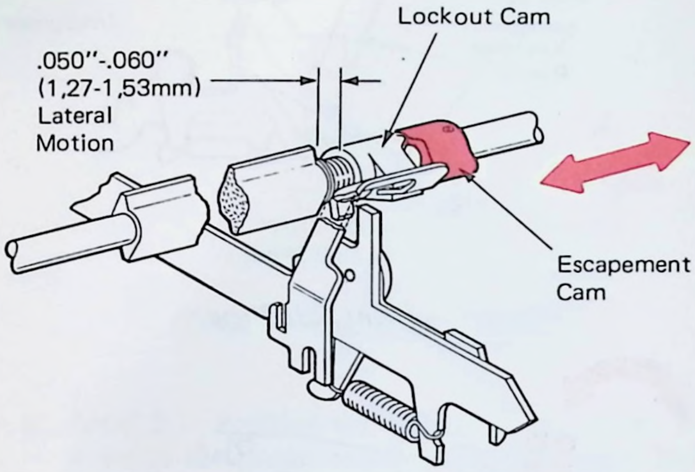


(Right Side View)

---

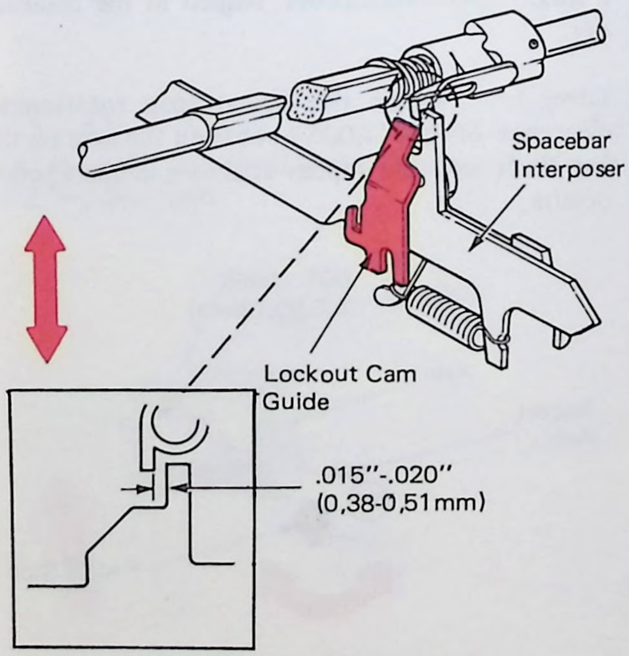
12. *Lockout Cam (Level 1)* – With the lockout cam on the high point of the escapement cam, adjust the escapement cam laterally so the lockout cam will have .050"-.060" remaining movement available toward the left.

NOTE: Be sure to maintain the proper radial adjustment of the escapement cam.



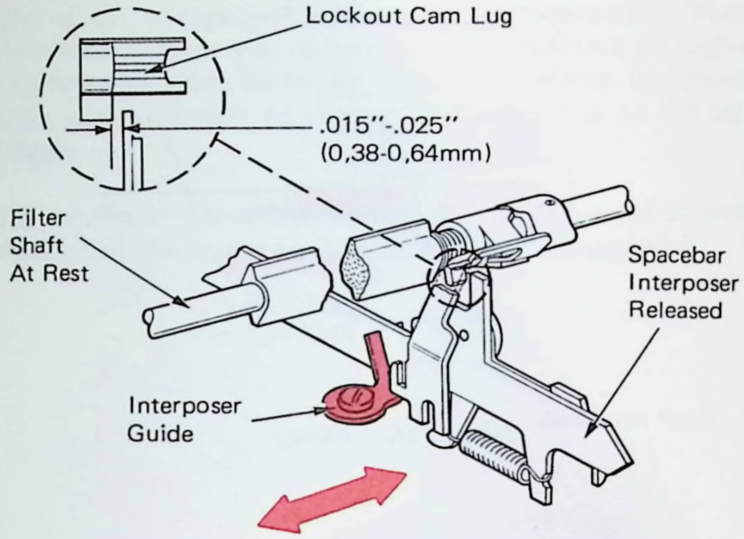
---

13. *Lockout Cam Guide (Level 1)* – With a character half cycled, adjust the lockout cam guide up or down so the spacebar interposer will move to the rear .015"-.020" when it is unlatched.



---

14. *Spacebar Interposer Guide (Level 1)* – With the filter shaft at rest and the spacebar interposer released, adjust the interposer guide left or right to obtain .015"-.025" clearance between the interposer and the lockout cam lug.

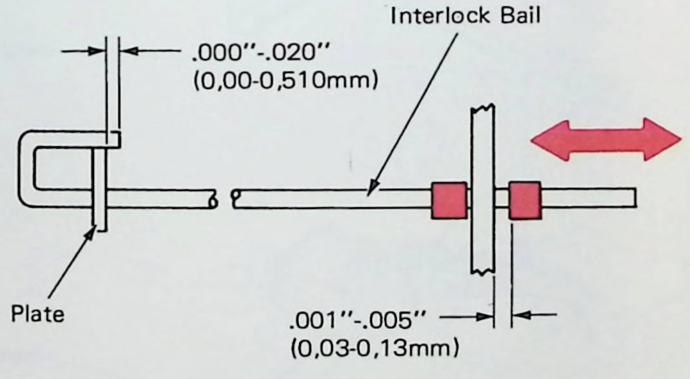


NOTE: The following adjustments pertain only to machines with space-to-print interlocks installed.

---

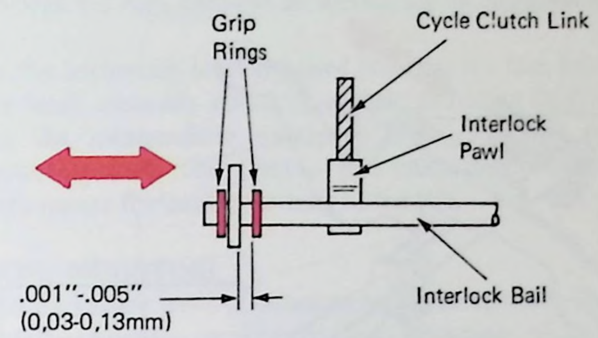
15. *Interlock Bail* – Adjust the grip rings position on the interlock bar so the following conditions are met:

Level 1 – Position the grip clips at the right end of the interlock bail so there will be .001"-.005" end play and so the left end of the bail overlaps the plate by .000"-.020".



(Front View)

Level 2 – Position the grip rings at the left end of the interlock bail so there will be .001"-.005" endplay and so the interlock pawl will be centered on the cycle clutch link.

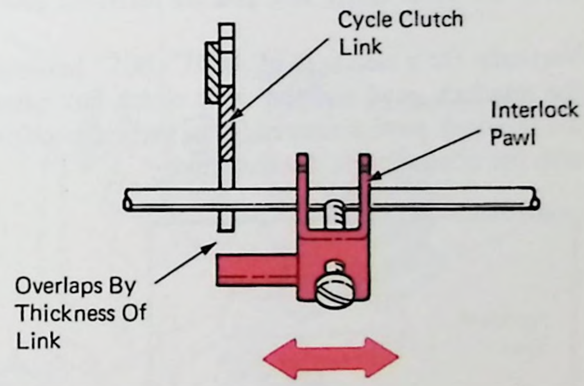


(Front View)

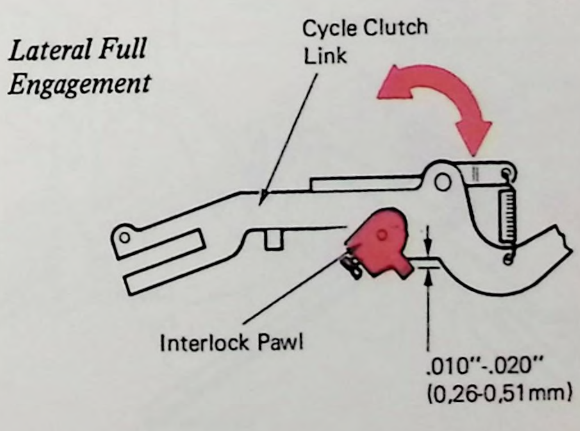
---

16. *Interlock Pawl (Level 1)* –

a. Adjust the interlock pawl left to right on the interlock bail so it overlaps the cycle clutch link by the thickness of the link.



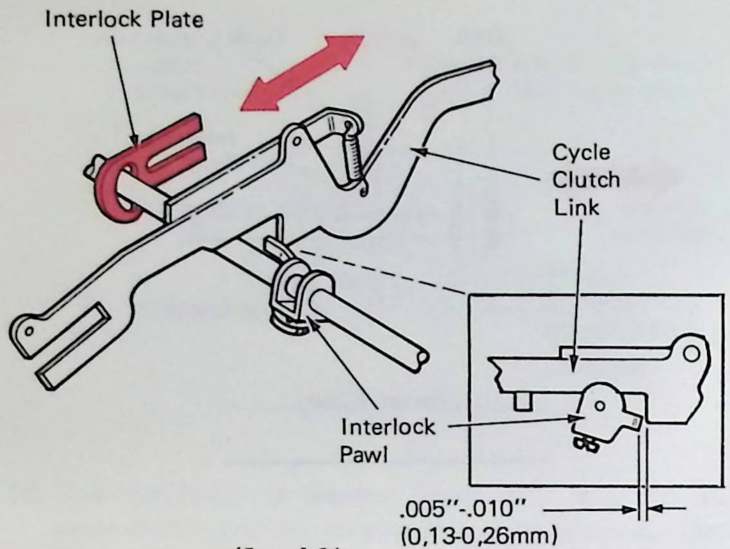
b. Adjust the interlock pawl radially so there will be .010"-.020" between the pawl and the link when the cycle clutch is released.



(Level 1 – Right Side View)

---

17. *Interlock Plate (Level 1)* – Adjust the interlock plate front to rear so a clearance of .005"-.010" exists between the interlock pawl and the cycle clutch link, when the pawl is actuated.

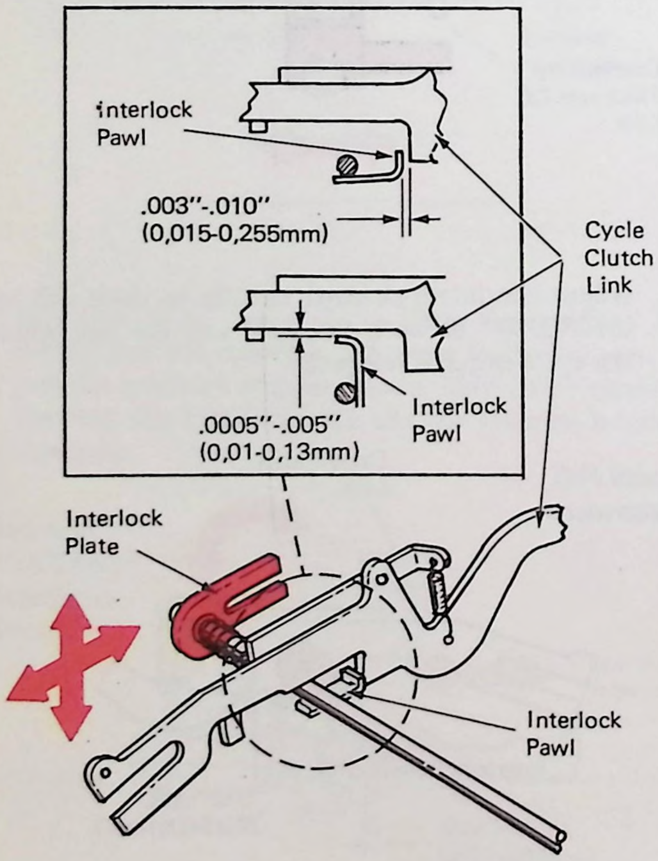


(Level 1)

Level 2 – Adjust the interlock plate for the following conditions:

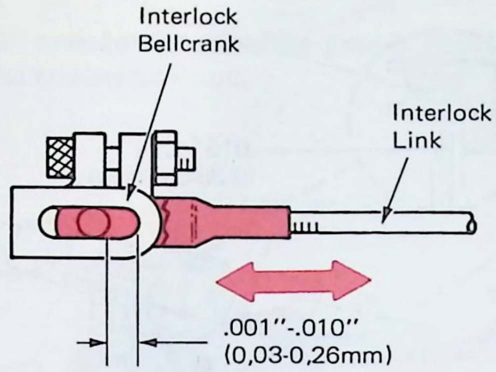
a. Front to rear for a clearance of .003"-.010" between the cycle clutch link and the interlock pawl.

b. Vertically for a clearance of .0005"-.005" between the interlock pawl and the cycle clutch link when the interlock pawl is rotated to the vertical position with the interlock link disconnected.



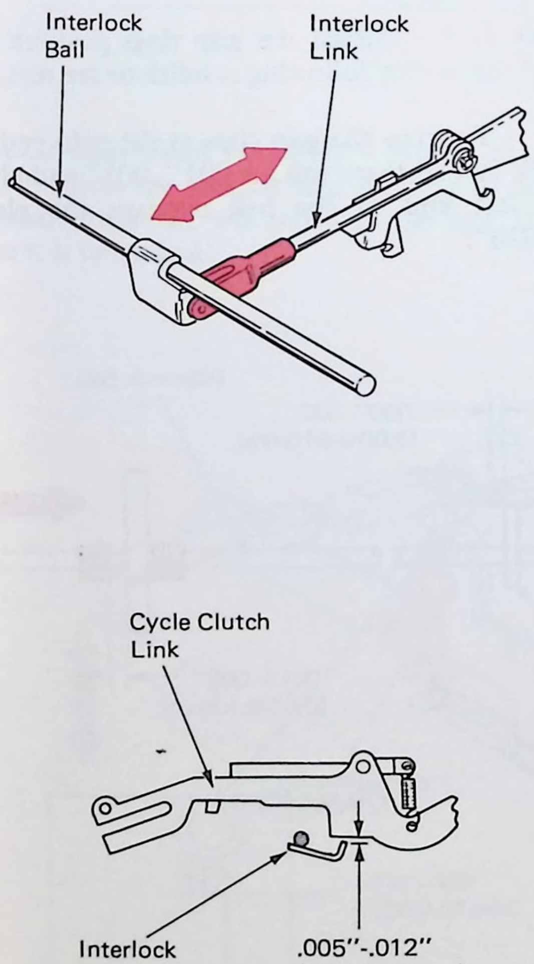
(Level 2 – Right Side View)

18. *Interlock Link (Level 1)* – Adjust the interlock link so a clearance of .001"-.010" exists between the end of the slot in the interlock bellcrank and the pin in the interlock link clevis.



(Right Side View)

Level 2 – Adjust the interlock link so a clearance of .005"-.012" exists between the interlock pawl and the cycle clutch link with the cycle clutch released.



(Right Side View)

The purpose of the backspace mechanism is to move the carrier to the left one space at a time. The backspace mechanism is operated by a clutch which couples rotational motion of the operational shaft to the backspace cam. When the clutch is operated, cam motion is transferred through a cam follower, latch assembly, intermediate lever, backspace rack, and backspace pawl to move the carrier to the left (Figure 1).

The complete operational theory of the operational control mechanism can be found in that section of this manual.

BACKSPACE OPERATION

When the backspace cam is rotated, motion is transferred through the cam follower to operate the backspace latch.

As the backspace latch is pulled down by the cam follower, the latch assembly pivots around its mounting stud, rotating the intermediate backspace lever clockwise on its mounting stud. The front of the intermediate backspace lever moves the backspace rack to the left.

PAWL MOUNTING

The backspace pawl is mounted to the escapement bracket directly above the escapement pawl. Movement of the backspace pawl to the left also moves the carrier and the escapement pawl to the left.

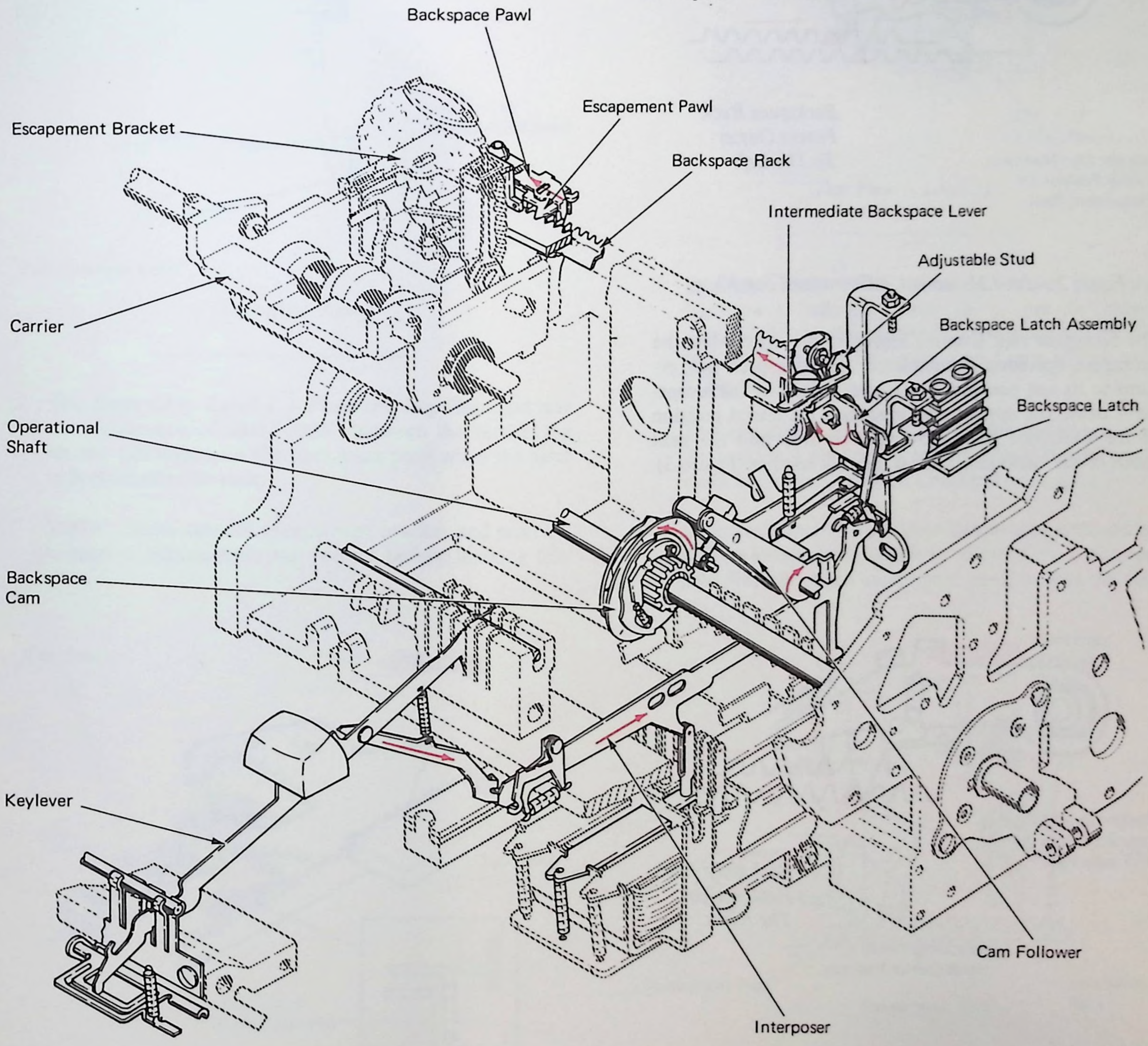


Figure 1 – Backspace Mechanism

PAWL OPERATION

The escapement pawl has a small upright stud on its upper surface which extends through an elongated slot in the backspace pawl (Figure 2). The stud allows the pawls to move front-to-rear independently and at the same time it ensures that they move left to right together. By maintaining the lateral relationship of the pawls, the escapement pawl will cam to the rear and fall into the previous tooth of the escapement rack as the backspace rack moves the backspace pawl and carrier to the left.

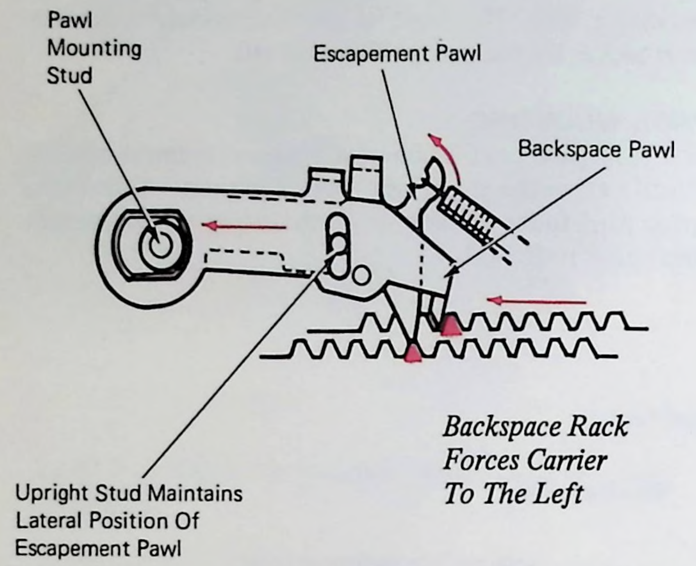


Figure 2 – Pawl Movement – Operating (Top View)

The backspace rack is spring loaded to the right. When the backspace operation is completed, the backspace rack returns to its rest position. The carrier is held by the escapement pawl. The upright stud maintains the lateral position of the backspace pawl allowing it to drop into the next tooth of the backspace rack as the rack restores (Figure 3).

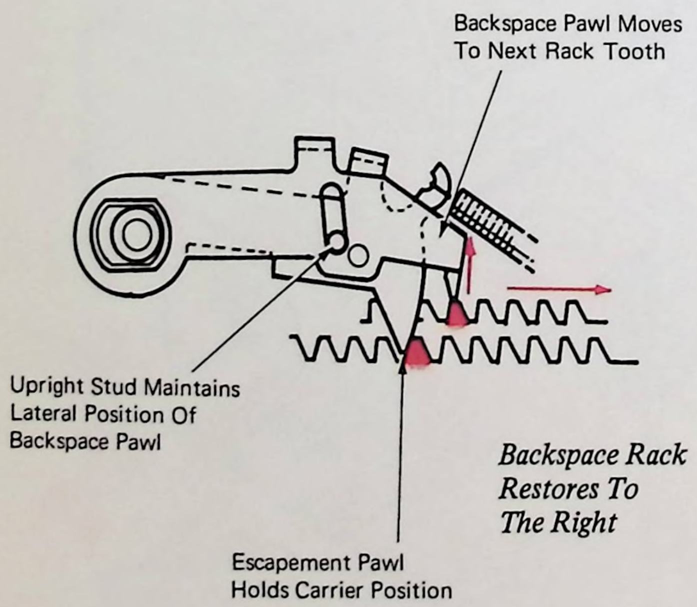
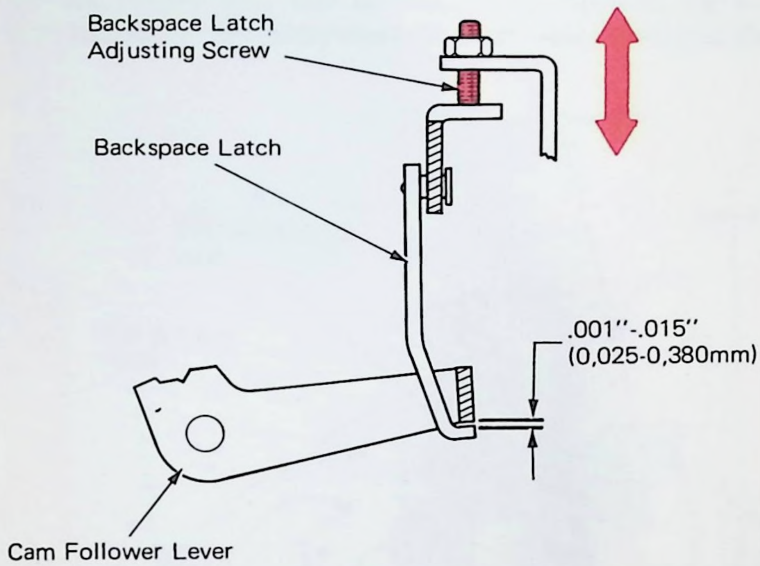


Figure 3 – Pawl Movement – Restoring (Top View)

BACKSPACE ADJUSTMENTS

NOTE: All operational control adjustments must be correct before attempting to make backspace adjustments.

1. *Backspace Latch Height* – Adjust the backspace latch adjusting screw for .001"-.015" clearance between the latch and the cam follower lever. This adjustment should be made to the low side of the spec to ensure a minimum of lost motion.

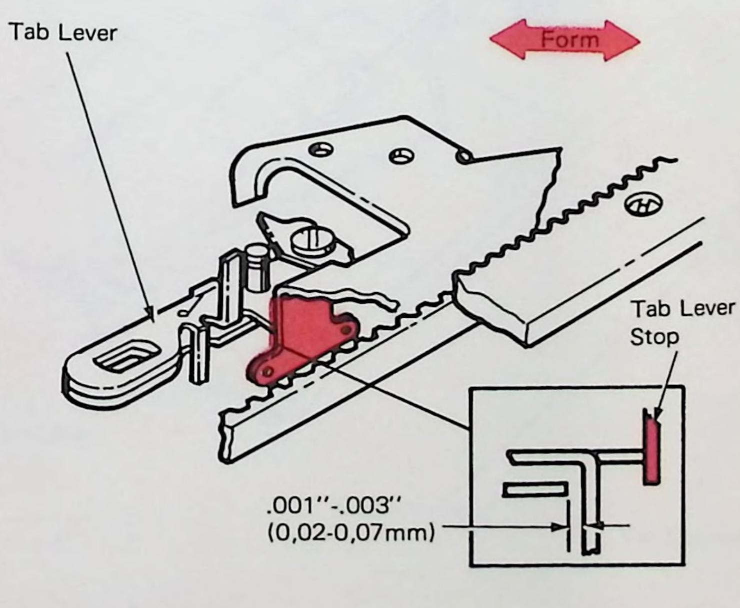


(Left Side View)

---

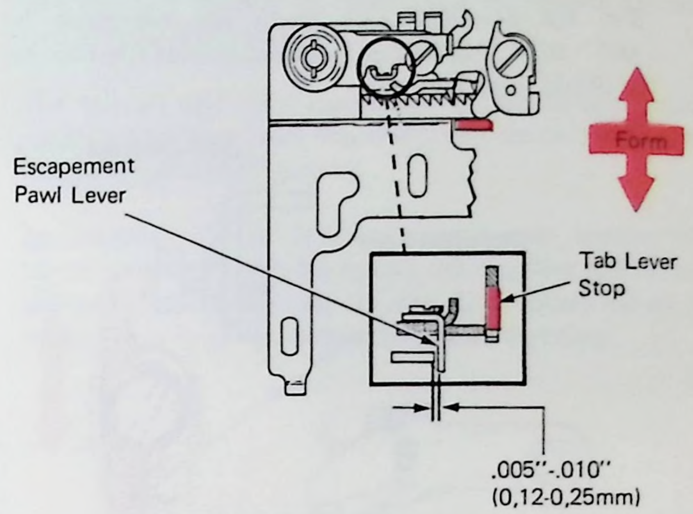
2. *Tab Lever Stop Level 1* – Form the stop front and rear for a clearance of .001"-.003" between the vertical lug on the tab lever and the backspace pawl when the pawl is bottomed in its rack.

   NOTE: Make sure all escapement bracket and print escapement adjustments are correct before forming this stop.



(Level 1)

Level 2 – Form the stop front and rear for a clearance of .005"-.010" between the vertical lug on the escapement pawl lever and the backspace pawl when the pawl is bottomed in its rack.



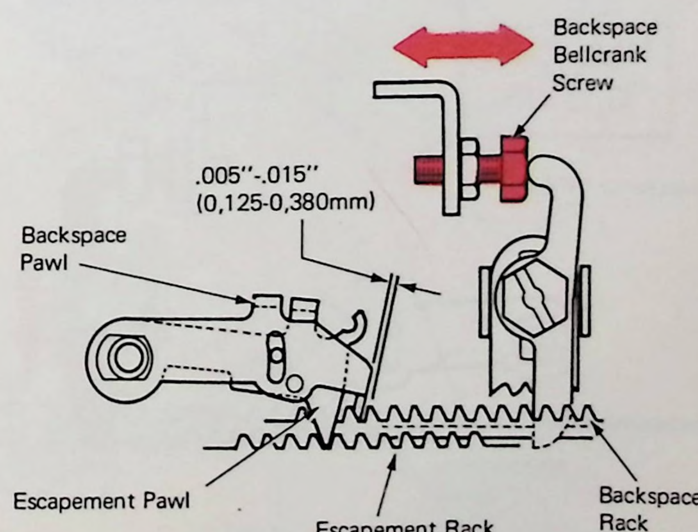
(Top View – Level 2)

---

3. *Backspace Rack* – With the machine at rest, adjust the backspace bellcrank screw in or out to obtain .005"-.015" clearance between the working surface of a rack tooth and the backspace pawl. Check at both ends of the writing line.

   This adjustment minimizes lost motion and ensures that the backspace pawl will positively reset in the next rack tooth at the completion of a backspace operation.

   Excessive clearance can cause escapement problems as well as backspace problems by allowing the backspace pawl, instead of the escapement pawl, to hold the carrier.



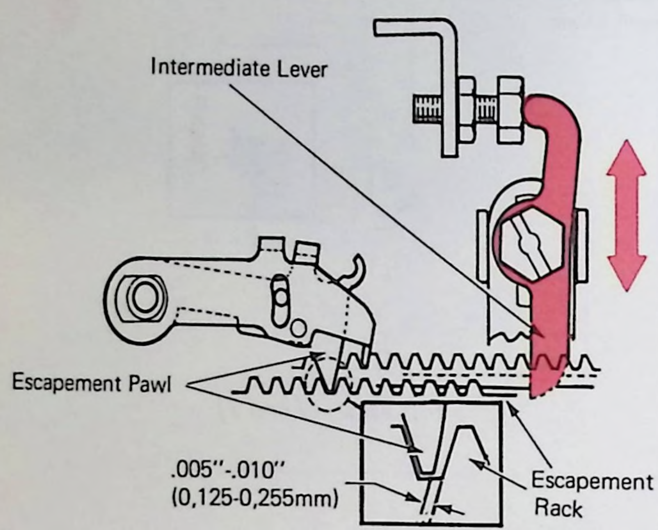
(Top View)

---

4. *Backspace Motion* – This adjustment is obtained by adjusting the intermediate lever front-to-rear. Any time this adjustment is changed, the backspace rack adjustment (3) should be checked and readjusted if necessary. Moving the lever to the rear increases backspace rack motion.

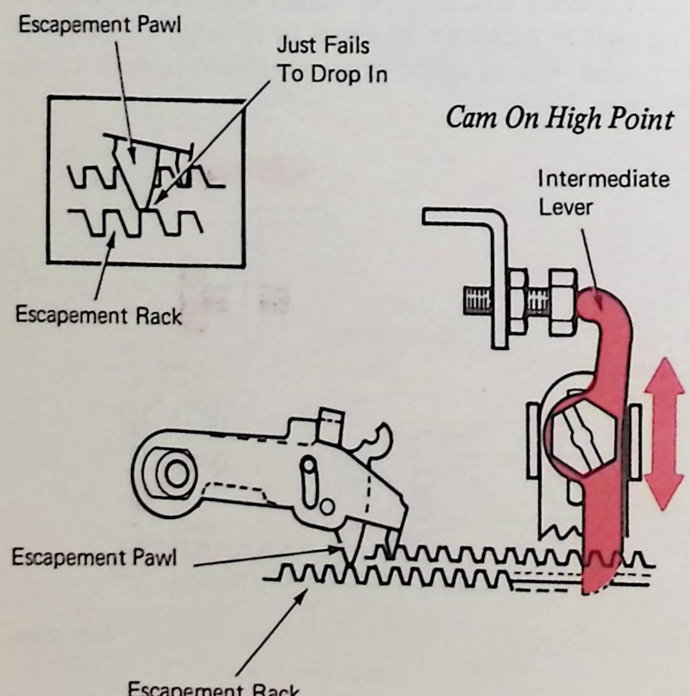
Level 1 – With the backspace cam manually operated to the high point, the escapement pawl should drop into the preceding rack tooth and overthrow by .005"-.010". Adjust the intermediate lever front-to-rear to obtain this adjustment.

Cam On High Point



(Top View – Level 1)

Level 2 – Adjust the intermediate lever so that a backspace operation just fails under hand operation. During a powered backspace operation, the carrier develops enough momentum for a positive operation. Too much motion will cause double or space-and-a-half backspacing.



(Top View – Level 2)

TAB OPERATIONAL THEORY

The purpose of the tab mechanism is to rapidly move the carrier to the right to a predetermined point on the writing line.

By operating the tab keylevers, the tab interposer is released, allowing the tab/space/backspace cam to rotate, delivering downward motion to the tab latch (Figure 1). Operation of the tab latch transfers motion through the tab bellcrank, intermediate lever, and torque bar link to rotate the tab torque bar. The tab torque bar operates the tab lever located on the escapement bracket, which removes the escapement pawl and backspace pawl from their associated racks. This allows the carrier to move to the right under mainspring tension to a predetermined point on the writing line. This action can also be initiated by the tab magnet operating the tab interposer. Operational theory for the cam and cam follower are contained in the operational control section of this manual.

The tab set and clear mechanism is used to select each position that the carrier will stop when the tab mechanism has been operated (Figure 1).

By operating the tab set and clear keybutton, motion will be transferred through the tab set and clear link and tab set and clear arm to rotate the tab rack. This motion will set or clear a tab stop at the position the carrier is resting

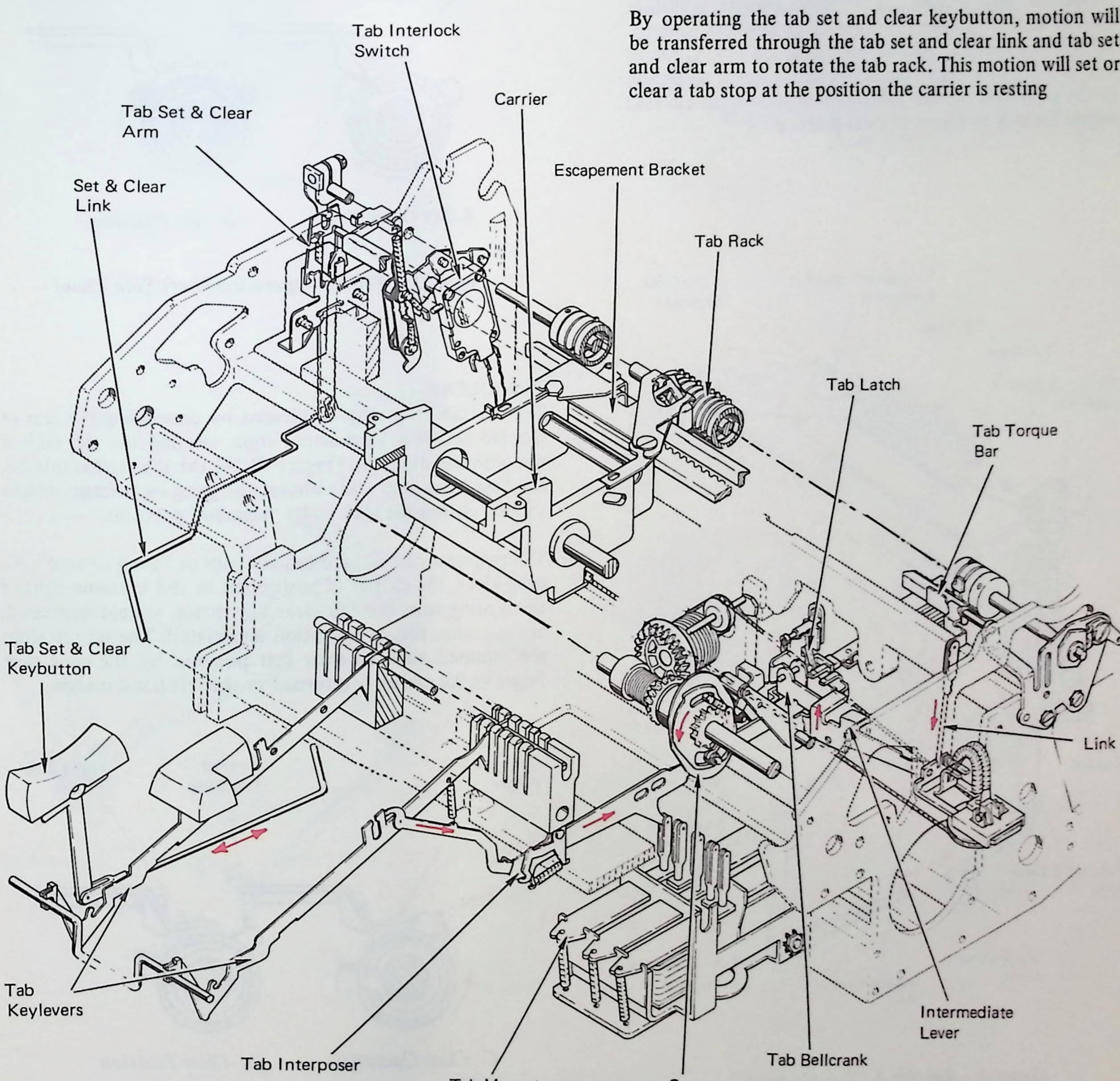


Figure 1 – Tab Mechanism

TAB SET AND CLEAR

The tab set/clear keybutton is located at the left side of the keyboard (Figure 2). A set & clear link extends towards the rear from the set/clear keybutton and is connected to the tab set/clear arm. The tab set/clear arm is mounted on a bracket in such a way that it will toggle front or rear at the top. The tab/set/clear bellcrank is mounted on the left end of the tab rack and its lower projection fits into a notch in the top of the tab set/clear arm.

When the set/clear keybutton is depressed, motion is transferred through the set & clear link, the tab set/clear arm, and the set/clear bellcrank to rotate the tab rack.

The tab rack is located parallel to and just to the rear of the escapement rack (Figure 2). Tab stops operate in slots in the tab rack with one stop for each escapement position. By rotating the tab rack, an individual tab stop is forced into contact with either the escapement bracket projection or the gang clear bracket. This motion rotates the tab stop within the rack to the set or clear position.

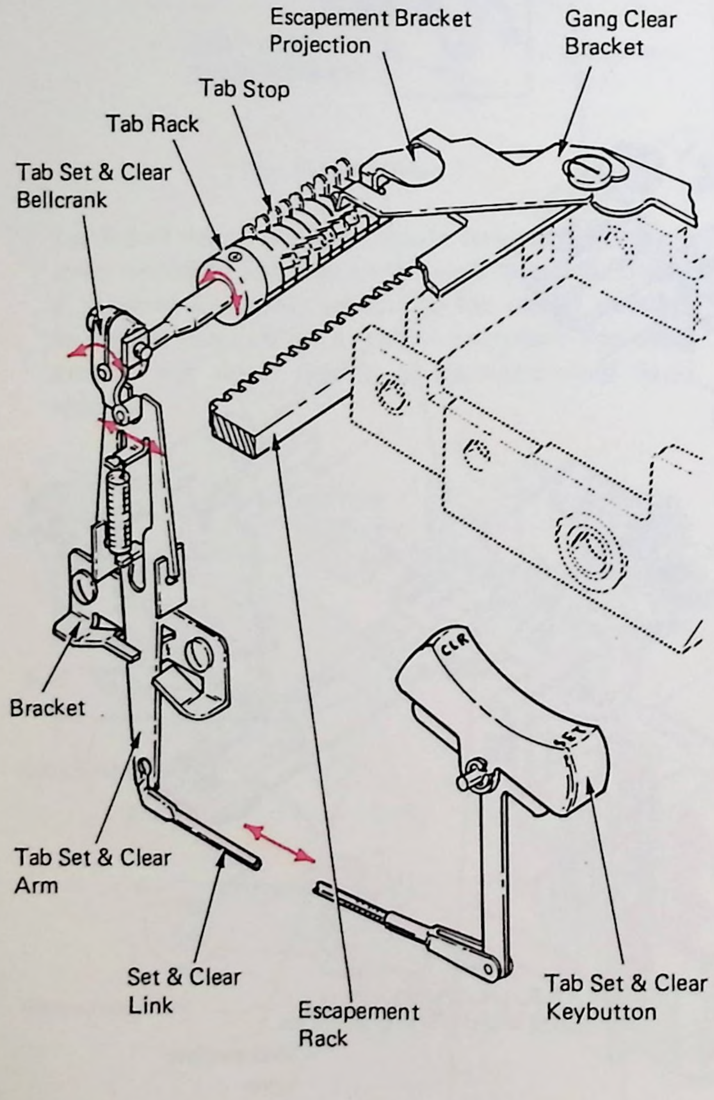


Figure 2 – Tab Set & Clear Mechanism

TAB SET

As the tab rack is rotated in the set direction (Figure 3), a tab stop corresponding to the carrier position contacts the projection on the escapement bracket and the tab stop is rotated within the tab rack.

When the tab set button is released, the tab rack restores to its rest position. The working surface of that tab stop will now be lower than the other tab stops, or in the "set" position.

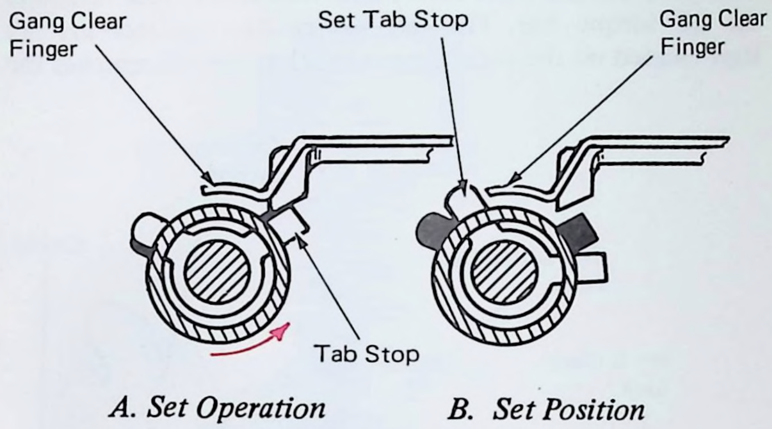


Figure 3 – Tab Set Operation (Left Side View)

TAB CLEAR

The set tab stop may be cleared by depressing the rear of the tab set/clear keybutton, thus rotating the tab rack in the opposite direction (Figure 4). As the tab rack is rotated, the "set" tab stop will contact the gang clear finger and be rotated within the rack to its "cleared" position.

Tab stops may be cleared individually or "gang cleared". To gang clear, the carrier is positioned to the extreme right of the writing line, the tab clear keybutton is held depressed, and a carrier return operation is initiated. The set tab stops are cammed back to their rest position by the gang clear finger as the carrier is returned to the left hand margin.

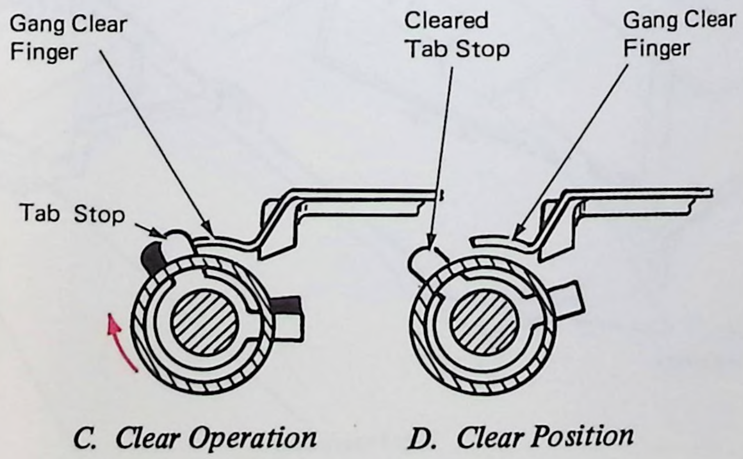
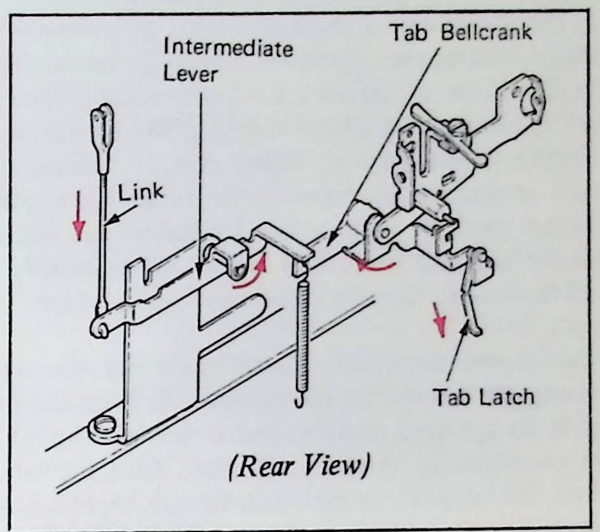


Figure 4 – Tab Clear Operation (Left Side View)

TAB ACTUATING

The tab keybutton is mounted near the left side of the keyboard (Figure 5). Depression of the tab keybutton operates the left tab keylever and a bail at the front of the keyboard. This bail causes a second keylever at the right side of the keyboard to move down. This second keylever does not have a stem for a keybutton, and is used only to trip the tab interposer. When the tab interposer is released by either the keylever or the tab magnet, the backspace/spacebar/tab cam will be released and the tab latch will be positioned under the rear of the cam follower. As the cam rotates, the cam follower will pull the tab latch down. The downward movement of the tab latch causes the tab bellcrank to rotate. This motion is transferred through an intermediate lever and link to rotate the tab torque bar.



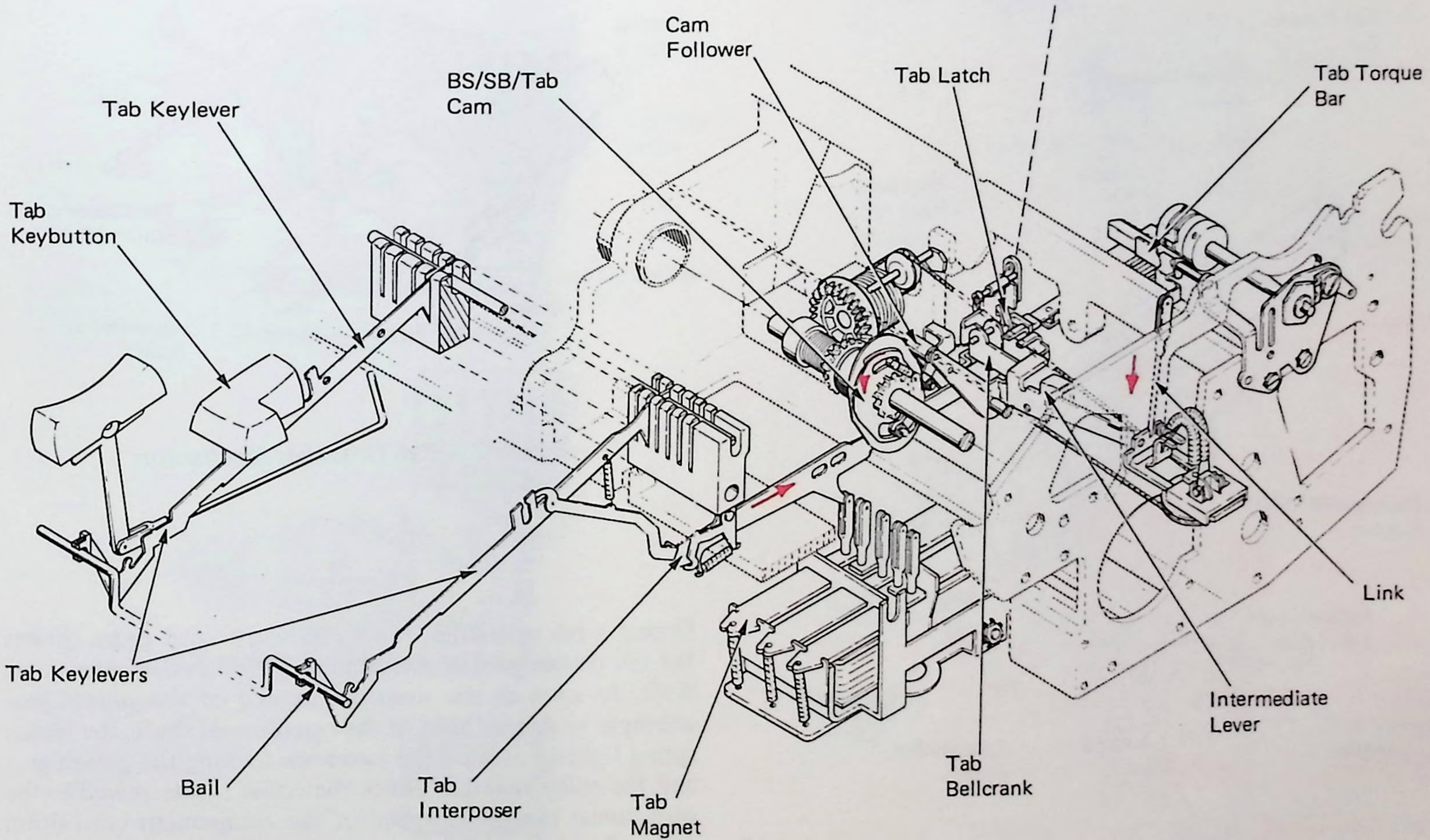


Figure 5 – Tab Actuating

TAB LEVER OPERATION

The tab torque bar is located parallel to the escapement rack. As the torque bar rotates, it contacts a round pin on the upper portion of the tab lever, forcing it to the rear. An escapement lever is attached to the tab lever and has a lower lug that extends down in front of the escapement and backspace pawls (Figure 6). As the tab lever is moved to the rear, the lower lug of the escapement lever contacts the backspace and escapement pawls, removing them from their racks. When the escapement pawl just clears its rack, it is pulled to the right by the pawl spring. The backspace pawl will move to the right an equal amount because of the upright connecting pin between the escapement pawl and backspace pawl. As soon as the escapement and backspace pawls are removed from their racks, the carrier will be allowed to move to the right under mainspring tension.

As the tab lever continues to move to the rear, the tab lever latch engages a notch in the tab lever to latch the mechanism in its operated position and to prevent the tab lever from overthrowing into the tab rack. With the tab lever latched, the tab pawl (mounted on the tab lever) is now in a position to contact the next set tab stop as the carrier moves to the right.

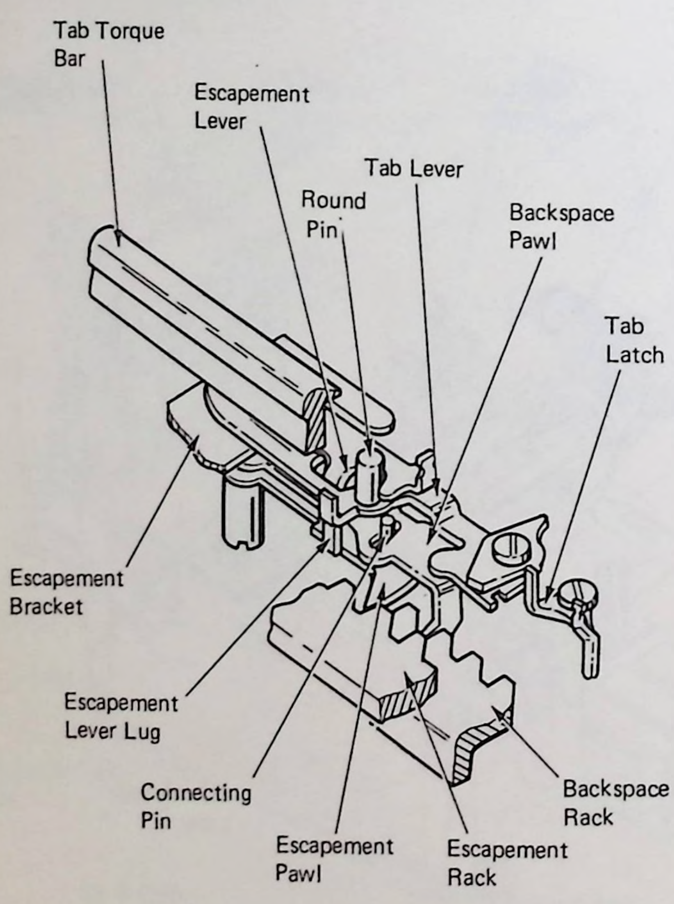


Figure 6 – Tab Lever Operation

TAB GOVERNOR

The carrier speed during a tab operation is controlled to prevent parts breakage or rebounding to the wrong position. The tab governor controls the carrier speed by limiting the speed at which the mainspring tension can turn the escapement cord drum to wind up the tab/escapement cord (Figure 7).

The beveled gear of the escapement cord drum meshes with the tab governor pinion gear. The governor pinion gear mounts on the operational shaft between two collars that are setscrewed to the operational shaft. The left collar and the pinion gear have hubs that are connected by a clutch spring. The clutch spring is wound so that it slips when the pinion gear is held stationary and the operational shaft is turning (Figure 7).

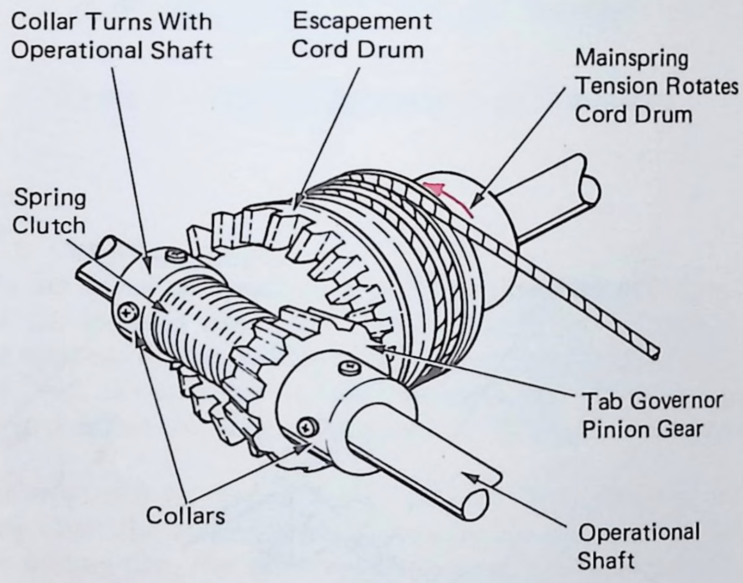


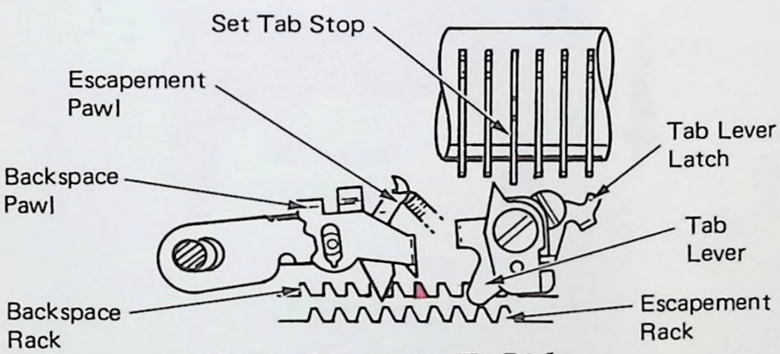
Figure 7 – Tab Governor Mechanism

During a tab operation, the escapement cord drum rotates the tab pinion gear in the same direction as the operational shaft. As soon as the rotational speed of the pinion gear attempts to exceed that of the operational shaft, the clutch spring tightens around the two hubs locking the pinion gear and the collar together. Since the collar is setscrewed to the operational shaft, the speed of the escapement cord drum will be limited to the speed of the operational shaft.

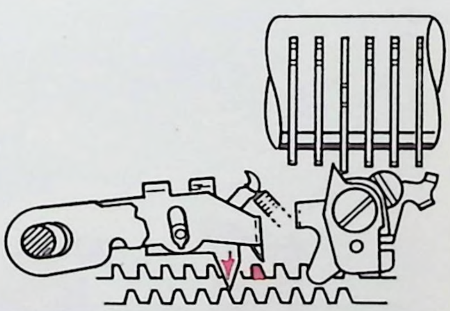
TAB UNLATCHING

As the carrier moves to the right, the tab lever pawl contacts a set tab stop and the tab lever stops moving. However, the carrier and pawls will continue moving to the right because of the elongated mounting hole in the tab lever. Continued movement of the carrier and pawls past the stopped tab lever will cause the escapement pawl to slide off the lug on the escapement lever. The escapement pawl will then be free to restore back into the rack under its spring load. The backspace pawl does not have a cut out notch so it will remain held by the escapement lever lug (Figure 8).

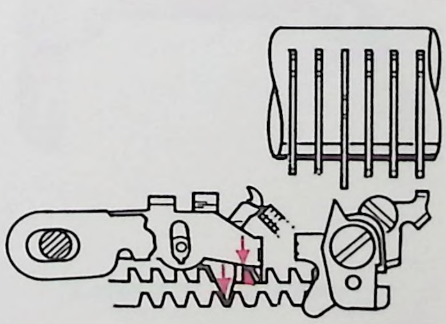
Further movement of the carrier in relation to the stopped tab lever will cause the tab lever to slip off its latch. When the tab lever restores, it will allow the backspace pawl to re-enter its rack. Although all parts have been unlatched and restored to their respective racks or rest positions, the carrier has not stopped. When the escapement pawl was released from its rack, its spring tension held the escapement pawl fully extended to the right in its elongated mounting hole and against the left side of the pawl mounting stud. After the escapement pawl enters the rack its movement to the right is stopped by a rack tooth. The carrier continues to move to the right until the pawl mounting stud contacts the right side of the elongated slot in the escapement pawl and stops.



Carrier Movement To Right



Tab Lever Pawl Contacts Tab Stop



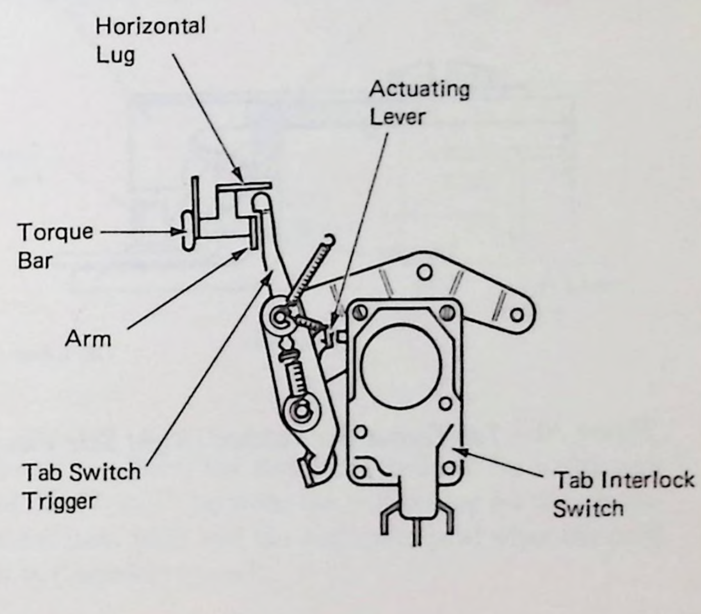
Carrier Stopped By Escapement Pawl

Figure 8 – Tab Unlatching Operation

TAB INTERLOCK SWITCH

A tab interlock switch is used during a tab operation to prevent other print or functional operations while the carrier is moving to a set tab stop positon. The tab interlock switch is mounted on the inside left rear area of the powerframe (Figure 9). The switch is operated by an arm on the left end of the tab torque bar. As the tab torque bar is pivoted, the arm moves upward pulling upward on the tab switch trigger. Since the torque bar rotates through an arc, the trigger will cam off the arm. However, the trigger will be in contact with the rear side of the arm and will be cammed toward the rear as the torque bar continues to pivot.

The motion of the trigger is transferred through the actuating lever to the interlock switch. The N/C contact of the switch will open the voltage line from the electronic device to the printer magnets, and further operation of the printer will be delayed until the tab torque bar restores.



(At Rest)

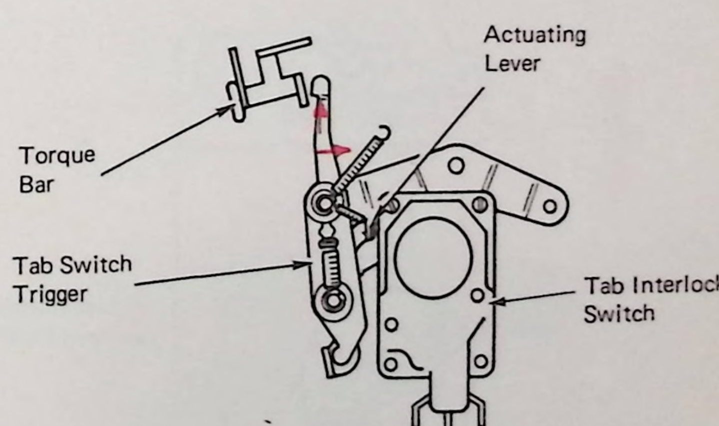


Figure 9 – Tab Interlock Switch (Operated – Right Side View)

To hold the tab interlock switch operated for the duration of the tab operation, the tab torque bar must be held actuated until the tab lever is unlatched.

The tab torque bar is trapped and held in the actuated position by a round pin on the tab lever and an upright lug in front of the torque bar (Figure 10).

The round pin was used initially to latch out the tab lever when the torque bar was rotated. The upright lug in front of the torque bar holds the torque bar operated until the tab lever is unlatched.

A retaining plate prevents the torque bar from moving up and disengaging with the tab lever.

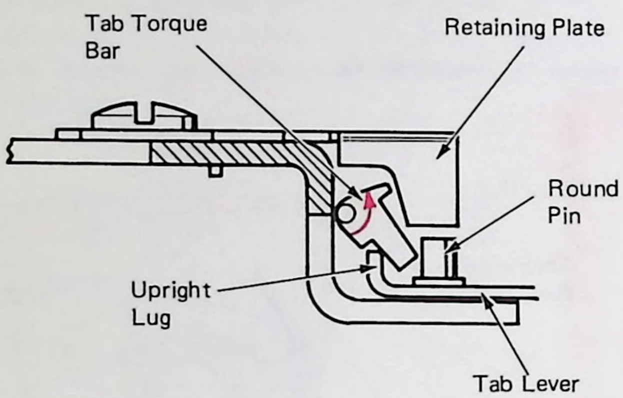


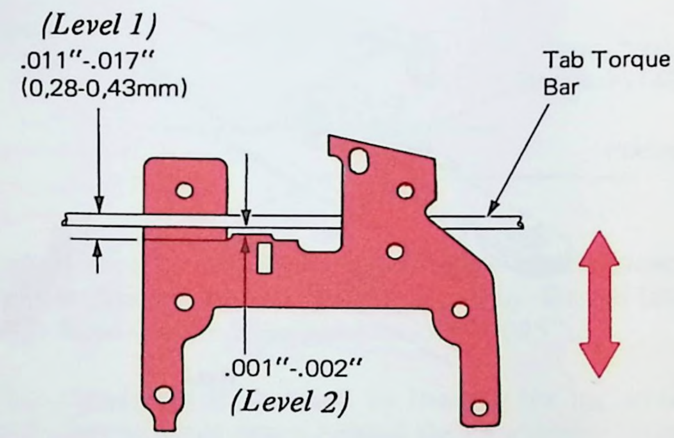
Figure 10 – Tab Torque Bar Latched (Right Side View)

TAB ADJUSTMENTS

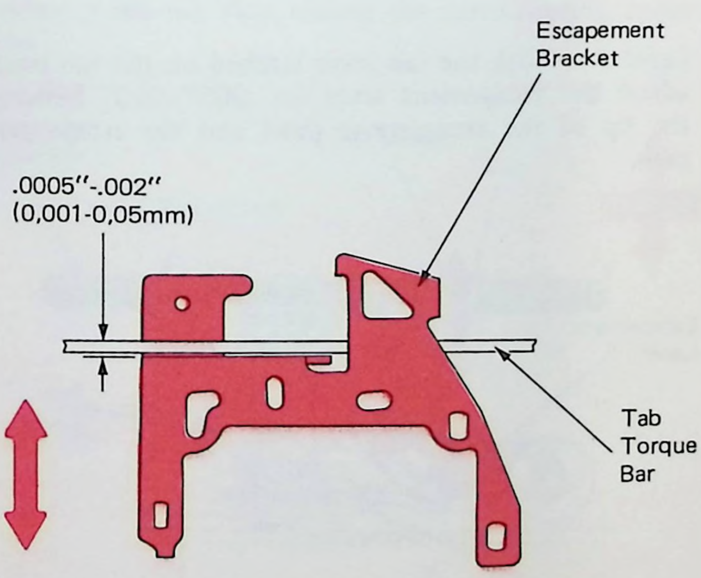
The cord tension and mainspring adjustments should be correct before making the tab adjustments. These two adjustments may be found in the escapement section of this manual.

1. *Escapement Bracket* – Position the escapement bracket parallel to the tab torque bar while maintaining a clearance of:

   a. Level 1 – .011".017" between escapement bracket and torque bar (Level 1 did not have a raised area).
   b. Level 2 – .001"-.002" between raised area on escapement bracket and the torque bar.
   c. Level 3 – .0005"-.002" between escapement bracket and torque bar.

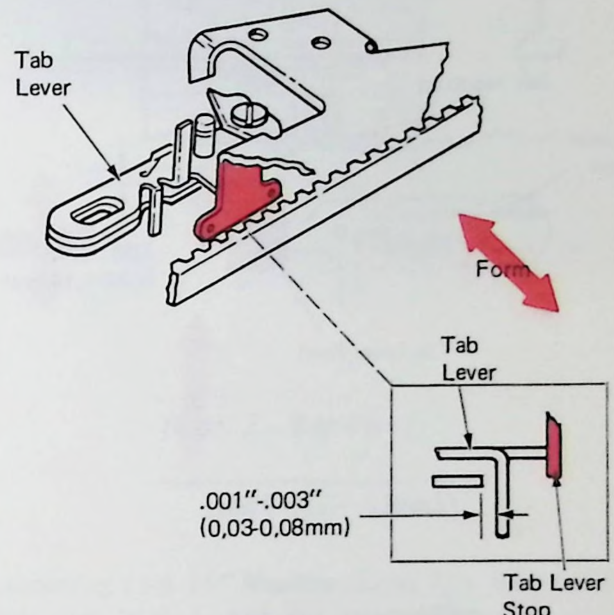


(Level 1 & 2)



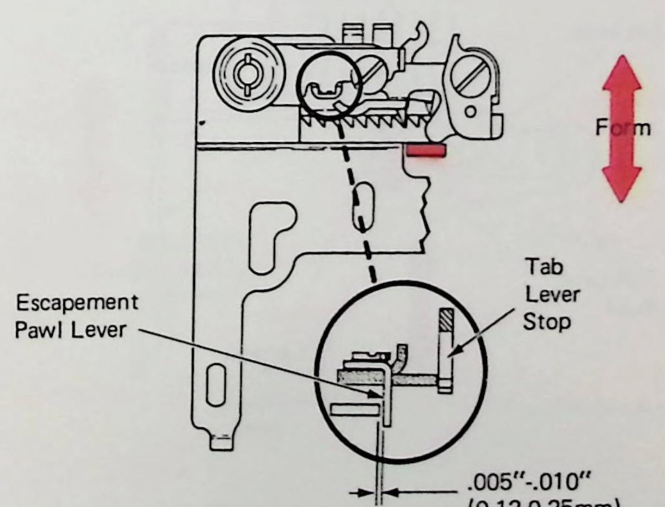
(Level 3 – Top View)

2. *Tab Lever Stop* –
   Level 1 – Form the stop front and rear for a clearance of .001"-.003" between the vertical lug on the tab lever and the bacskpace pawl when the pawl is bottomed in its rack.



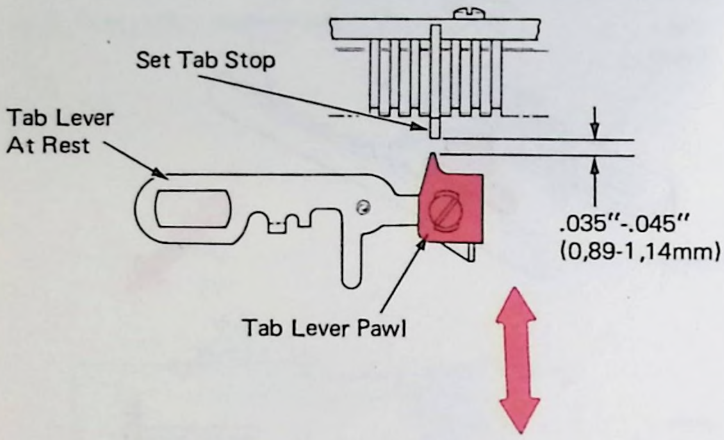
(Level 1)

Level 2 – Form the stop front and rear for a clearance of .005"-.010" between the vertical lug on the escapement pawl lever and the backspace pawl when the pawl is bottomed in its rack.



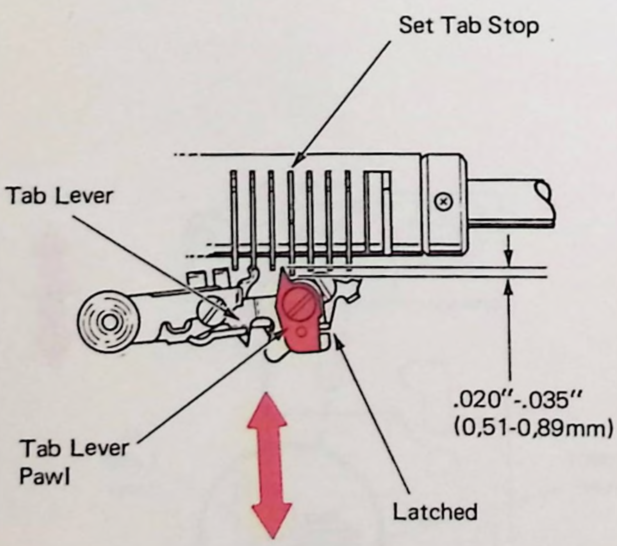
(Level 2 – Top View)

3. *Tab Lever Pawl (Level 1)* – Adjust the tab lever pawl front to rear for .035"-.045" clearance between the tip of the tab lever pawl at rest and the set tab stops. The adjustment of the tab lever pawl has an effect on the amount of overlap between the tab stop and the pawl tip in the active position. It also affects pawl clearance during tabulation. Unless the tab lever pawl is properly adjusted, correct pawl clearance can not be obtained.



(Level 1 – Top View)

Level 2 & 3 – With the tab lever latched out, adjust the tab lever pawl front to rear for .020"-.035" engagement with a set tab stop.



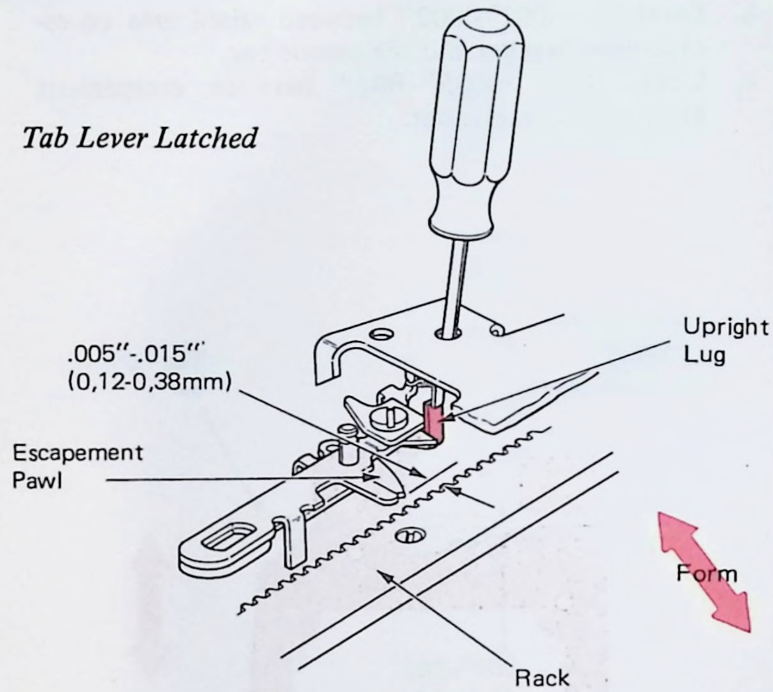
(Level 2 & 3 – Top View)

---

4. *Pawl Clearance* – Form the upright lug on the tab latch for a clearance of .005"-.015" between the tip of the escapement pawl and escapement rack teeth with the tab lever latched to the rear. This adjustment ensures that the escapement pawl will re-enter the rack as quickly as possible to minimize the chances of entering the wrong tooth.

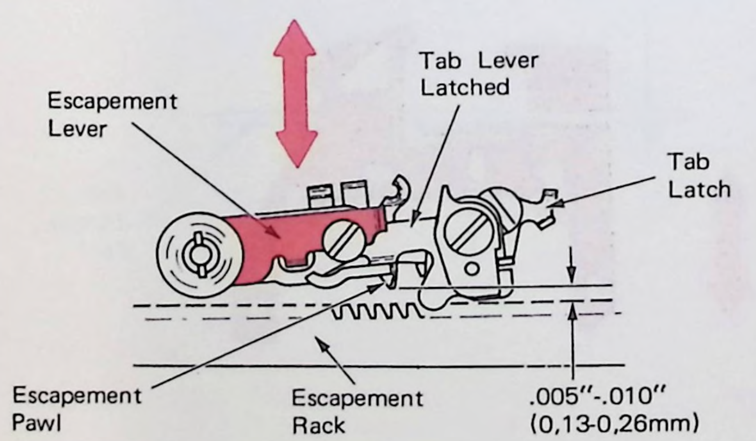
The upright lug of the tab latch may be formed with the three inch screwdriver by using it as a lever through the hole in the escapement bracket.

Tab Lever Latched



(Level 1 & 2 – Left Front View)

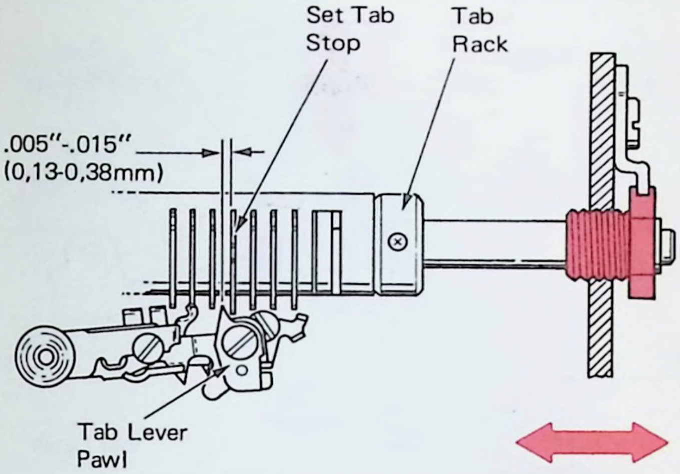
Level 3 – With the tab lever latched on the tab latch, adjust the escapement lever for .005"-.010" between the tip of the escapement pawl and the escapement rack.



(Level 3 – Top View)

---

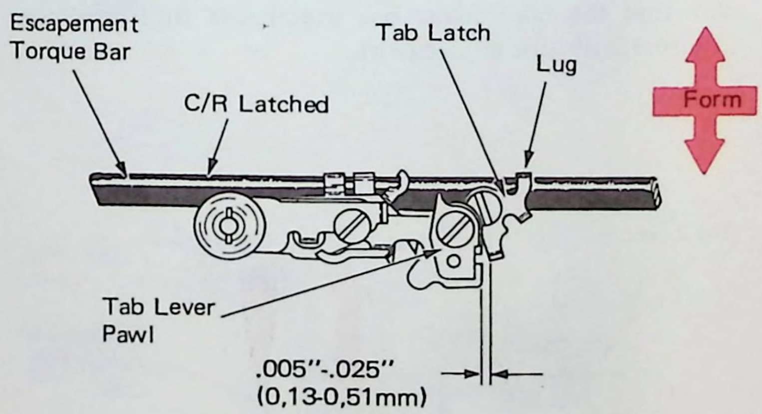
5. *Tab Rack Lateral* – Block the carrier from moving to the right and latch out the tab lever. Adjust the tab rack left to right for .005"-.015" clearance between the tab lever pawl and a set tab stop at the nearest point.



(Top View)

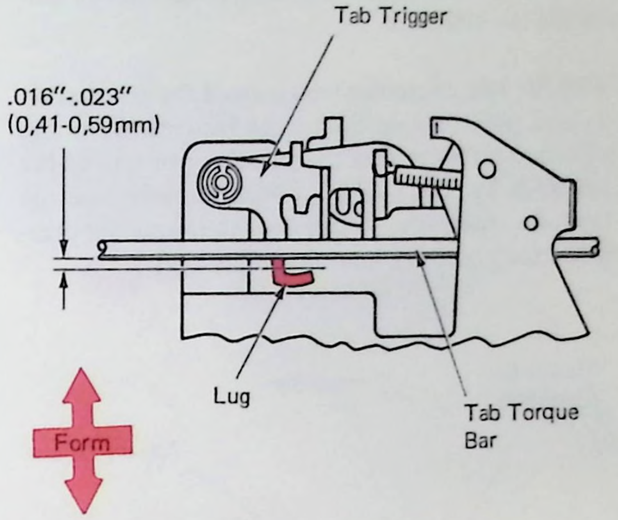
6. *Tab Interlock* – With the carrier return clutch latched, the escapement torque bar should rotate the tab latch away from the tab lever pawl by .005"-.025".

This adjustment is obtained by forming the lug on the latch that extends down behind the escapement torque bar. The adjustment ensures that the carrier return and tab cannot both be latched out simultaneously. If both were allowed to latch, the tab lever pawl would lock against a set tab stop during the carrier return operation.



(Top View)

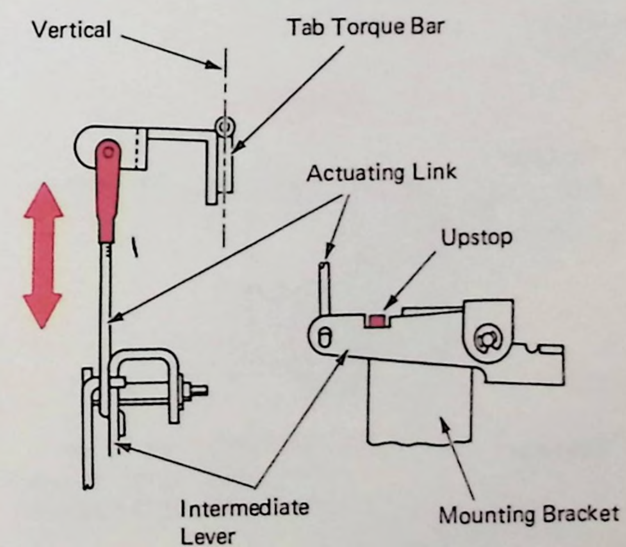
7. *Tab Trigger Extension (Level 2 Only)* – Form the front (curved) lug of the tab trigger to obtain .016"-.023" clearance between this lug and the tab torque bar with all parts at rest.



(Level 2 – Top View)

8. *Actuating Link 15" Machine (Level 1)* – With the B/S tab cam latched, and the intermediate lever resting against its upstop, adjust the actuating link clevis so that the tab torque bar hangs vertically.

NOTE: On machines with new style interlock contact form the upstop up out of the way.

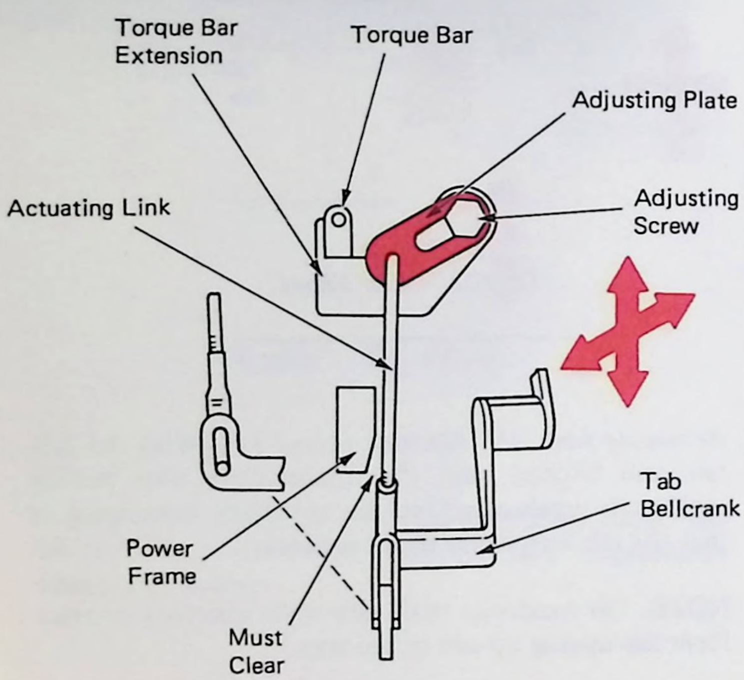


(Right Side View) *(Rear View)*

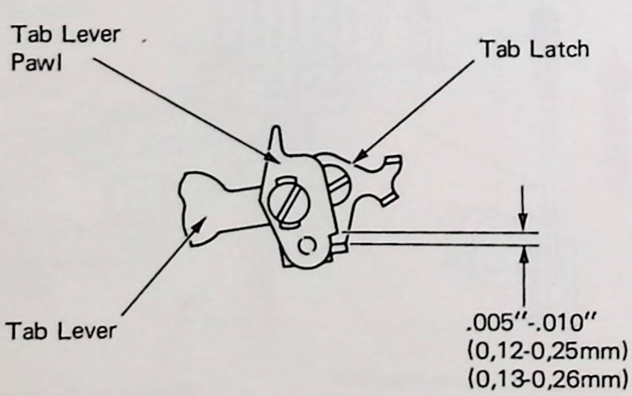
9. *Tab Lever Overthrow (Level 1)* – On the 11" machine position the adjusting plate as follows:
   a. Front to Rear - so that the actuator link and clevis clears the power frame.

NOTE: Clearance must be observed throughout full motion of the tab bellcrank.

   b. With the tab interposer released and the tab cam on its high point, rotate the torque bar (relative to the adjusting plate) so that the tab lever overthrows the tab latch by .005"-.010". Check to make sure the tab lever overthrow stop or the tab torque bar overthrow stud does not limit this adjustment.

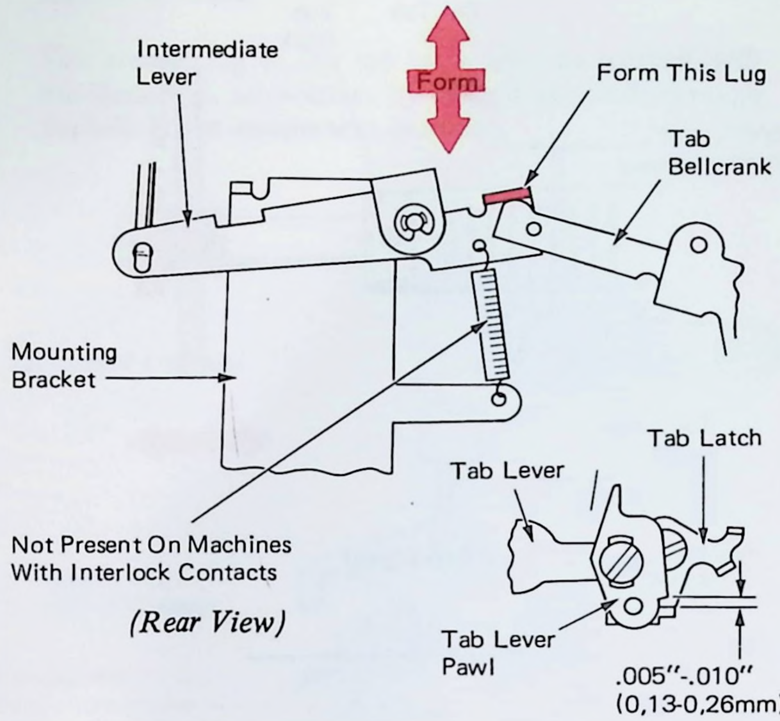


(Right Side View)



(Level 1 – Top View)

Level 1 - 15" machine –
With the tab interposer released and the backspace cam on its high point, form the intermediate lever lug so that the tab lever pawl overthrows the tab latch by .005"-.010".



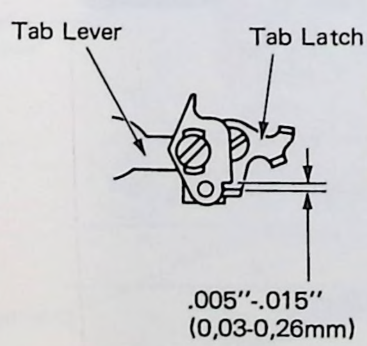
(Rear View)

(Top View)

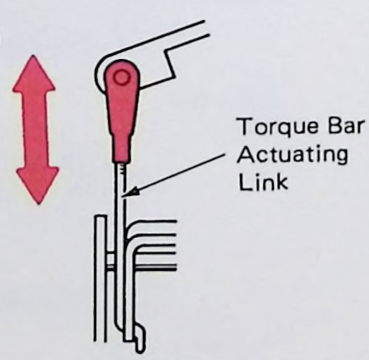
(Level 1)

Level 2 & 3 – With the tab cam on its high point, adjust the torque bar actuating link for .005"-.015" overthrow between the tab latch and tab lever.

NOTE: The carrier should be tapped lightly to the left before checking this adjustment. It should also be checked with the carrier in the center of its travel. Be sure that the tab torque bar overthrow stud does not interfere with this adjustment.



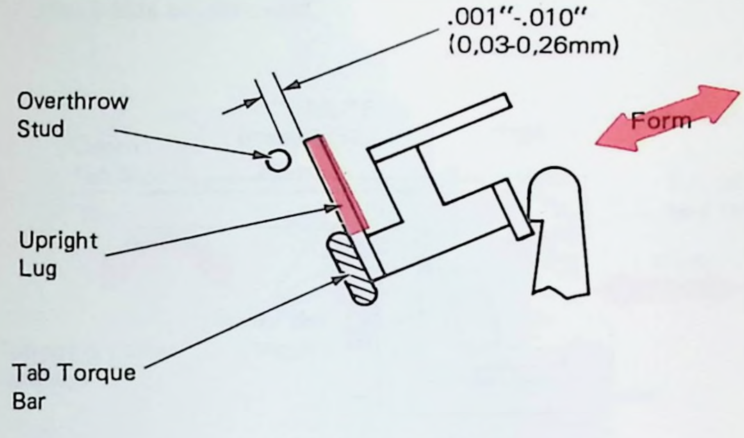
(Top View)



(Right Side View)

(Level 2 & 3)

10. *Torque Bar Overthrow Stud (Level 2 & 3)* – With the tab cam on its high point, form the upright lug on the left end of the torque bar for a clearance of .001"-.010" between this lug and the overthrow stud.



(Right Side View)

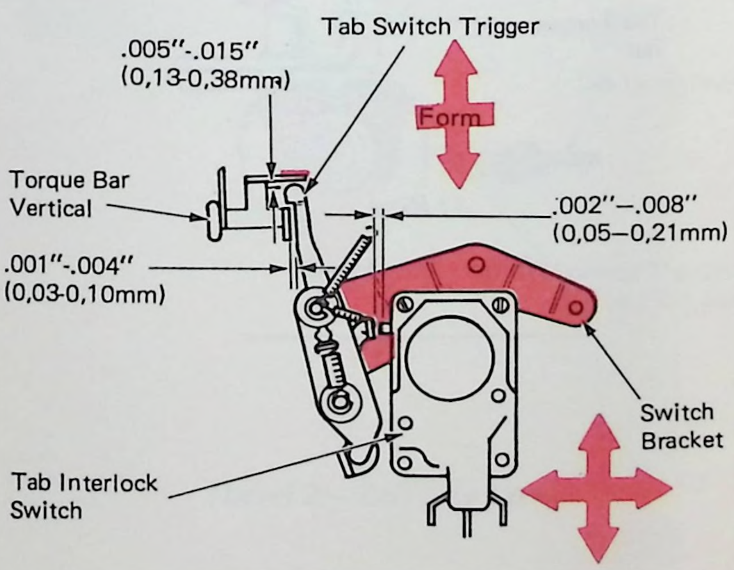
11. *Interlock Switch (Level 2 & 3)*
   a. With the torque bar in the rest position, form the horizontal lug on the left end of the tab torque bar so that .005"-.015" exists between the tab switch trigger and its latching surface.

   b. Tab interlock switch bracket. Adjust by its mounting screws for two conditions.

      1. Up and down so that the torque bar is vertical in the rest position. Be sure that torque bar linkage does not interfere when making this adjustment.

      2. Front to rear so that .001"-.004" clearance exists between the tab switch trigger and the rear edge of the tab torque bar extension.

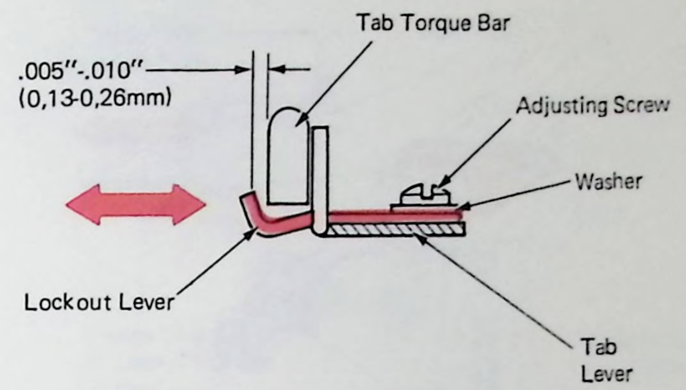
   c. Adjust the switch by its mounting screws for .002"-.008" clearance between the switch plunger and trigger.



(Right Side View)

12. *Lockout Lever (Level 1)* – Position to clear the torque bar by .005"-.010" with the torque bar at rest.

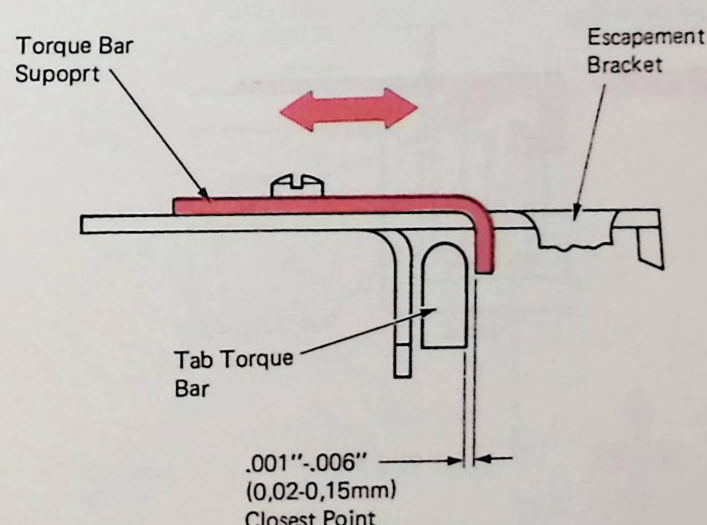
    NOTE: The position of the lockout lever must not choke off the motion of the tab lever during unlatching.



(Right Side View)

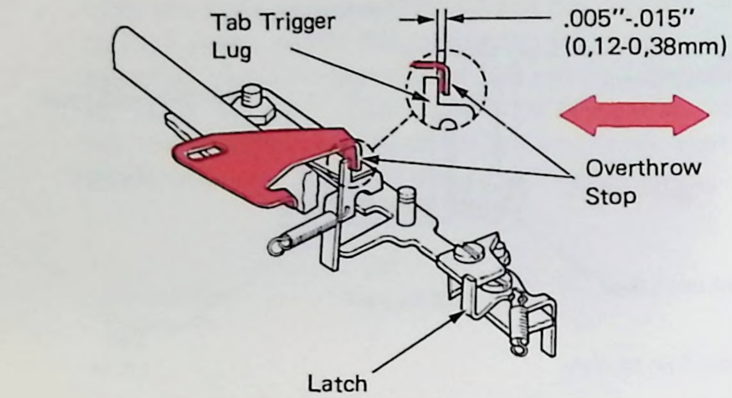
13. *Tab Torque Bar Support (Level 1)* – With the tab torque bar at rest, position the torque bar support to clear the torque bar by .001"-.006".

    The purpose of the torque bar support is the same as the retaining plate on the late style.



(Right Side View)

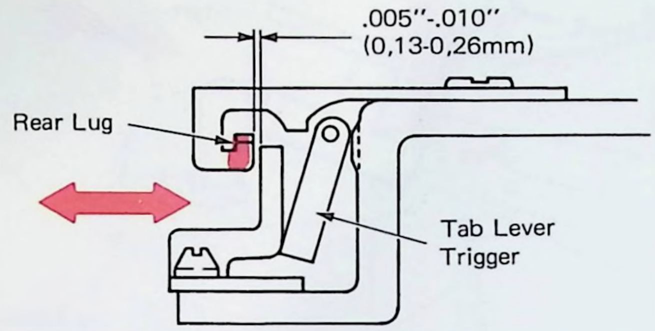
14. *Tab Lever Overthrow Stop (Level 1)* – Adjust the tab lever overthrow stop front or rear so that .005"-.015" clearance exists between the lug of the tab lever trigger and the overthrow stop when the tab lever is latched to the rear.



(Right Front View)

b. Form the rear lug for a clearance of .005"-.010" between the tab lever trigger and the rear lug with the tab cam on its high point.

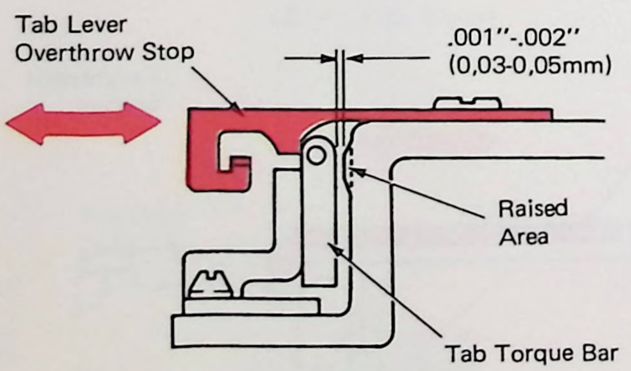
Cam On High Point



(Left Side View)

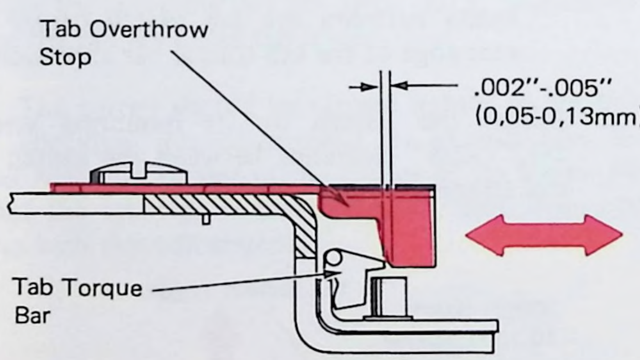
Level 2 – Adjust the tab lever overthrow stop for the following two conditions:

a. Front to rear to maintain a clearance of .001"-.002" between the tab torque bar and raised area on the escapement bracket.



(Left Side View)

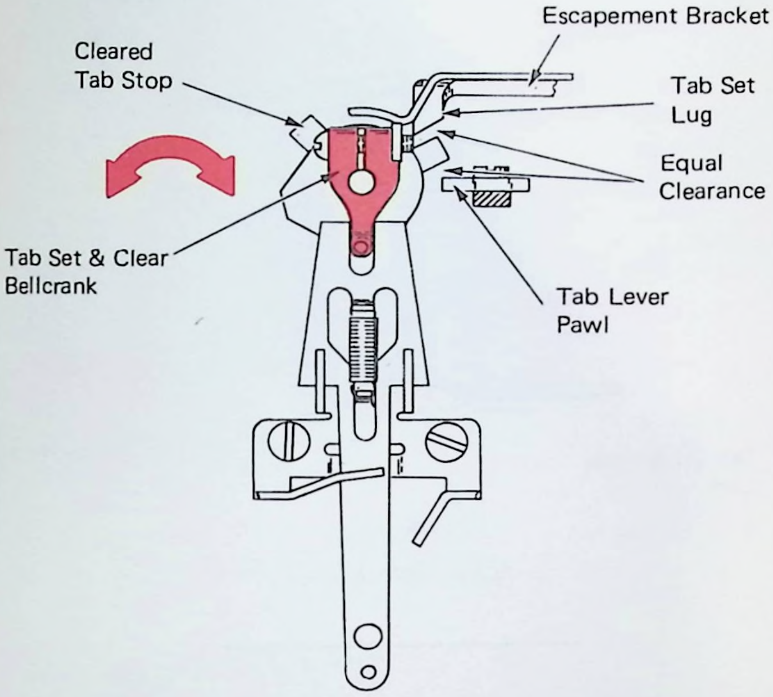
Level 3 – With the tab torque bar at rest, position the tab overthrow stop front to rear for a clearance of .002"-.005" between the torque bar and the tab overthrow stop.



At Rest

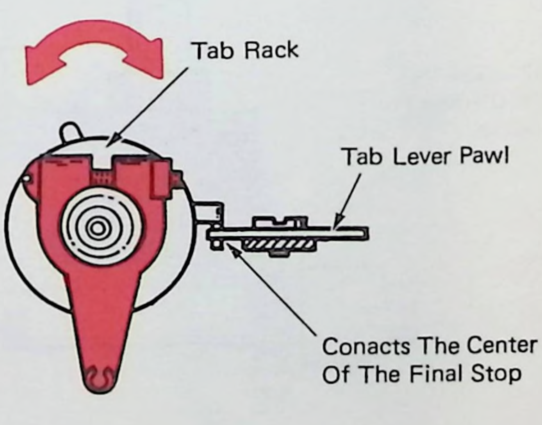
(Right Side View)

15. *Tab Rack Rotational (Level 1)* – With the tab lever latched to the rear, the cleared tab stops should be centered between the tab lever pawl and the tab set lug on the escapement bracket. Loosen the screw on the tab set and clear bellcrank and rotate the tab rack to make this adjustment.



(Level 1 – Left Side View)

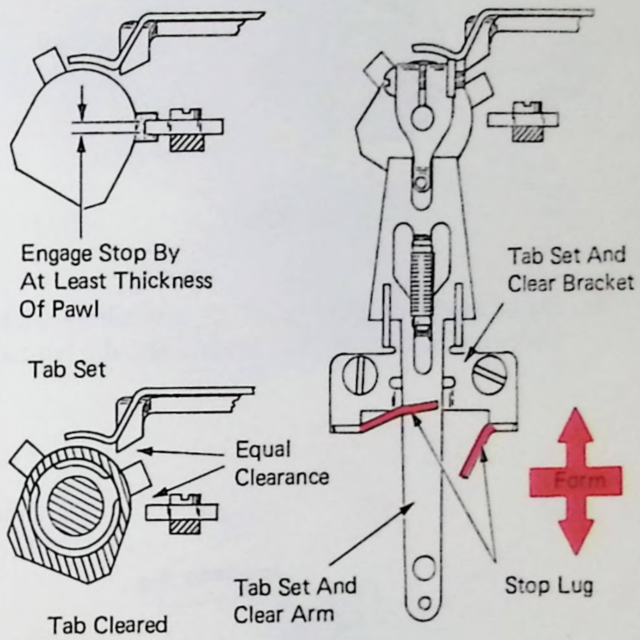
Level 2 – Adjust the tab rack rotationally so that the tab lever pawl contacts the center of the working surface of the final stop.



(Level 2 – Left Side View)

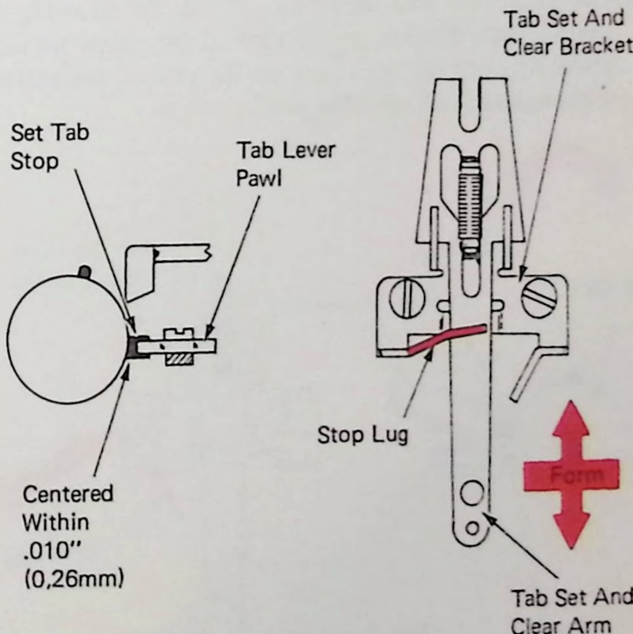
16. *Tab Set and Clear Bracket (Level 1)* – Form the stop lugs on the set and clear bracket so that the movement of the set and clear arm is restricted as the tab stops fully reach their set or clear position.

NOTE: On the early style tab set and clear mechanism, the stop lugs were anchored and adjusted by two screws on the outside of the power frame.



(Right Side View)

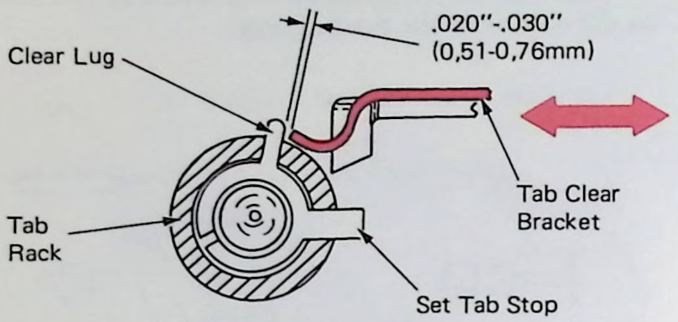
17. *Tab Set Stop Lug (Level 2)* – Form the set lug on the set/clear bracket so that when a tab stop is set, the tab lever pawl will contact the center of a set tab stop within .010".



(Left Side View)

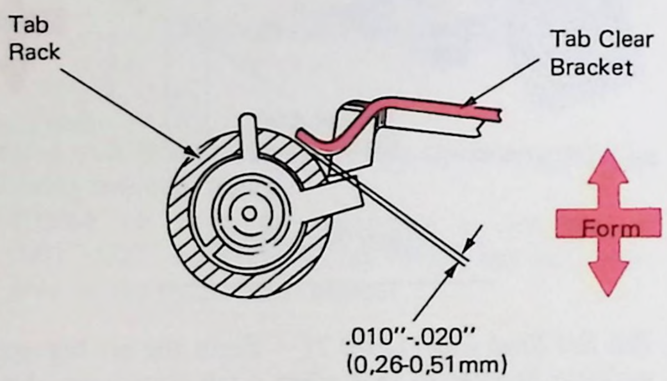
18. *Tab Clear Bracket* – Adjust the tab clear bracket as follows:

a. Front-to-rear for .020"-.030" clearance between the tip of the tab clear bracket and the clear lug on a "set" tab stop.



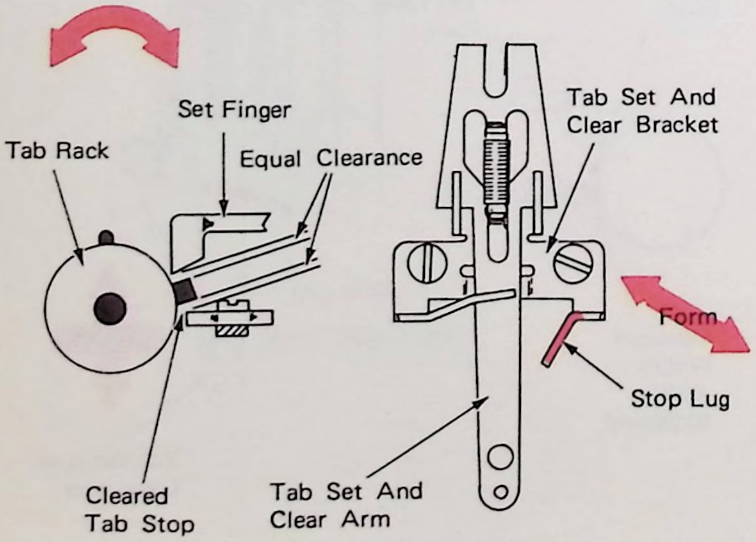
(Left Side View)

b. Up or down for .010"-.020" clearance between the underside of the tab clear bracket and the tab rack.



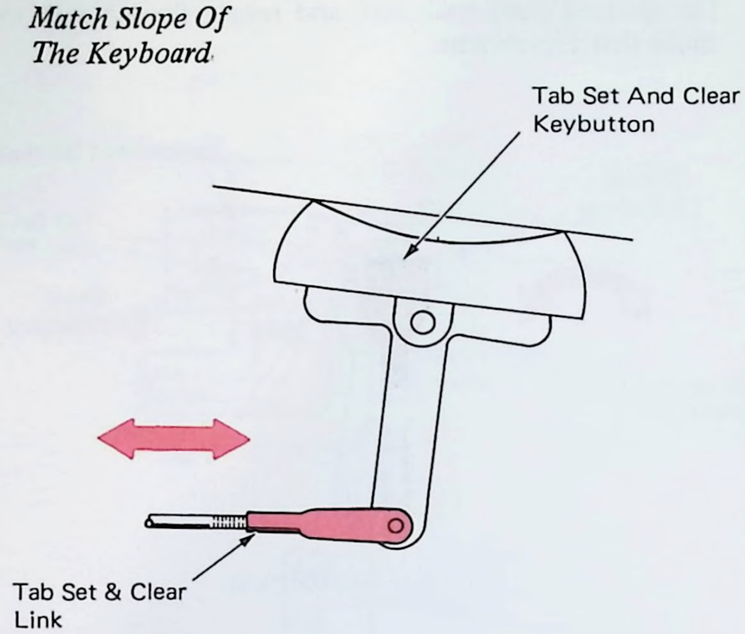
(Left Side View)

19. *Tab Clear Stop Lug (Level 2)* – Form the clear lug on the set/clear bracket so the cleared tab stops are centered between the set finger on the rear of the escapement bracket and tab lever pawl.



(Right Side View)

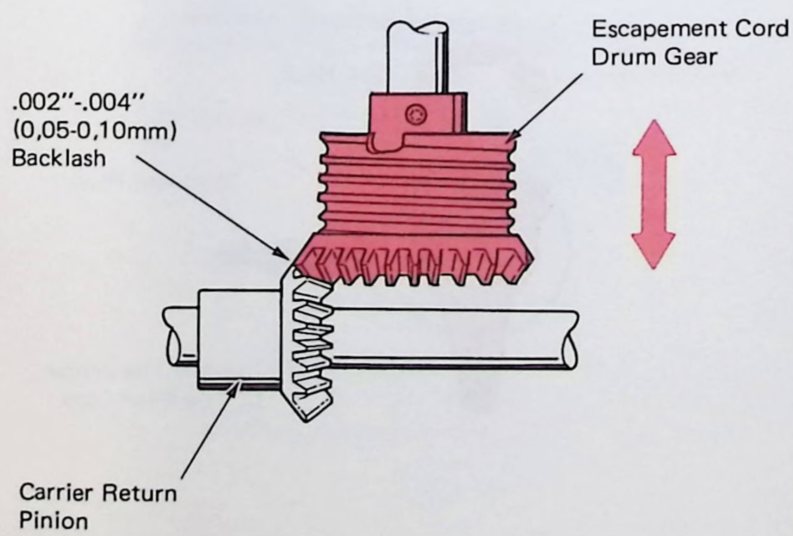
20. *Tab Set and Clear Keybutton* – Adjust the tab set and clear link so the tab set and clear keybutton matches the slope of the keyboard.



(Left Side View)

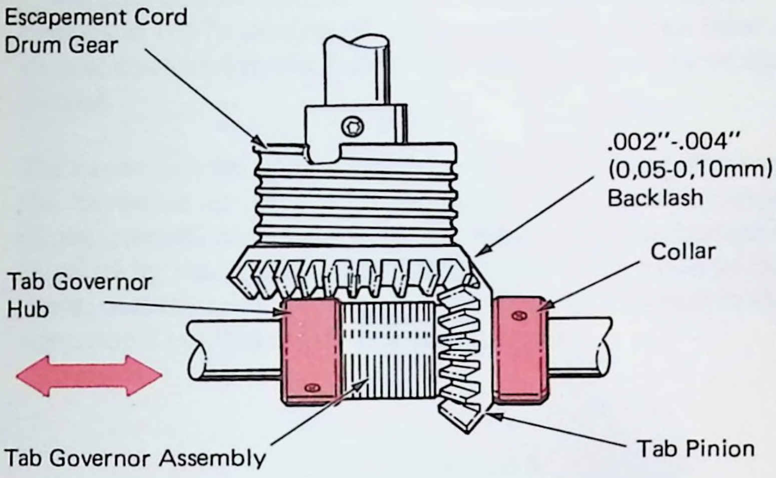
21. *Carrier Return Pinion Backlash* – Adjust the escapement cord drum gear front to rear to obtain .002"-.004" backlash between the carrier return pinion and the escapement cord drum gear.

NOTE: Recheck adjustment No. 5 in the Motor & Drive Section after making this adjustment.



(Top View)

22. *Tab Pinion Backlash* – Adjust the tab governor assembly left or right to obtain .002"-.004" backlash between the tab pinion and the escapement cord drum gear. The pinion should have a minimum of end play between the tab governor hub and collar yet still rotate freely.

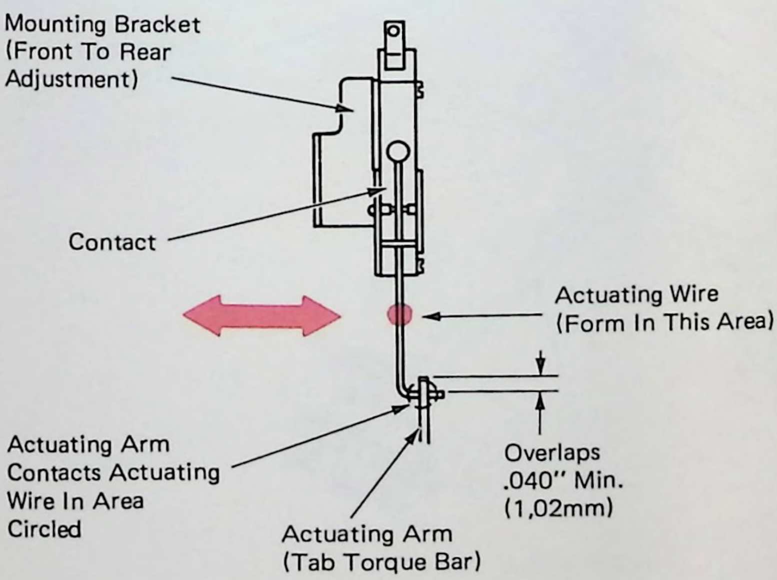


(Top View)

23. *Interlock Switch (Level 1)*

a. Form (in circled area) the actuating wire (left or right) so that it contacts the actuating arm near the right angle bend.

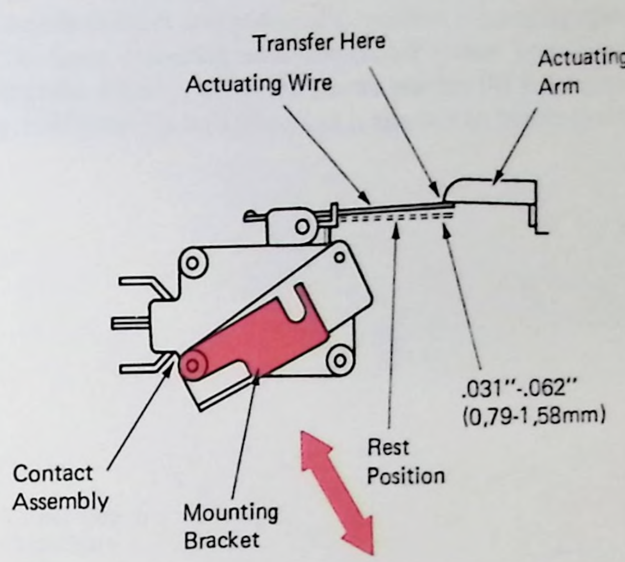
b. With the tab interposer released and the cam on its high point, position the mounting bracket (front to rear) so that the actuating arm overlaps (.040" minimum) the actuating wire. This ensures that the actuating wire does not get above the actuating arm.



(Rear Top View)

c. As the tab torque bar restores, position the mounting bracket (up or down) so that the contact actuating wire travels .031"-.062" after the contact transfers. This is done to ensure that the machine vibration does not cause the contact to transfer.

NOTE: During initiation of a tab operation, the switch must transfer (up position) before the backspace cam reaches its high point. Torque bar bounce must not retransfer the contact while the tab lever is latched out.



(Left Side View)

CARRIER RETURN OPERATIONAL THEORY

The purpose of the carrier return mechanism (Figure 1) is to rapidly reposition the carrier to the left margin. The index mechanism is activated during each carrier return operation to line space the paper. The end result of the carrier return and index operation leaves the carrier in position for printing at the beginning of the next line. The index mechanism is discussed in the Paperfeed and Index Section of this manual.

The carrier return operation can be initiated manually from the keyboard or with an electronic device by the carrier return magnet. Motion to operate the carrier mechanism is supplied by the carrier return/index cam. Operation of the carrier return/index cam and C-6 contact is discussed in the operational control section of this manual.

During a carrier return operation, several things occur (Figure 1). The carrier return clutch spring is engaged to provide motion to wind the carrier return cord on the carrier return cord drum and pull the carrier to the left margin. The escapement torque bar is rotated to remove the escapement and backspace pawls from their respective racks. The mechanism is latched in its active state to ensure the carrier is pulled completely to the left margin. The carrier return interlock contact is transferred to prevent succeeding operations from occurring until the carrier return operation is complete. Finally, when the carrier reaches the left margin, the mechanism is unlatched and is allowed to return to rest.

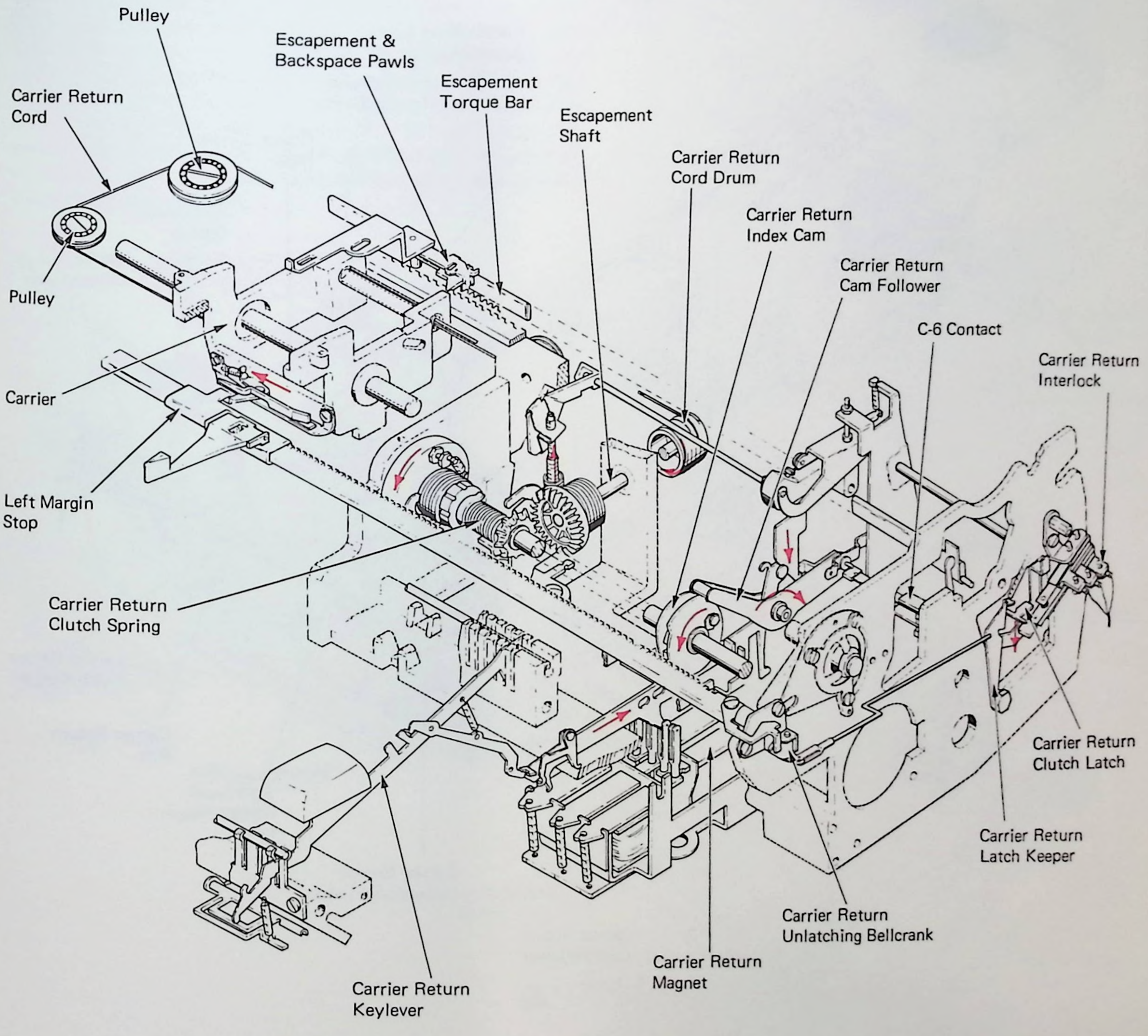


Figure 1 – Carrier Return Mechanism

CARRIER RETURN LATCHING

When the carrier return operational latch is pulled down by the cam follower, the latch arm presses the carrier return lever down (Figure 2). A stud on the carrier return lever fits in a slot in the intermediate latch actuating arm, and as the lever moves down, it rotates the arm and pivots the carrier return clutch latch shaft and clutch latch. As the carrier return clutch latch moves down, the carrier return latch keeper is pulled to the rear by an extension spring and engages the carrier return clutch latch, thereby, latching the mechanism in the operated condition.

PAWL REMOVAL

When the carrier return clutch latch moves down, it rotates the carrier return arm (Figure 2). As the carrier return arm is rotated, it contacts the escapement torque bar pivoting it to the rear which removes the escapement and backspace pawls from their racks. The pawls will not return to their racks until the carrier return arm is unlatched, at the left margin, allowing the escapement torque bar to restore.The escapement and backspace pawls are removed from their racks to eliminate noise and pawl damage caused by the pawls dragging over the teeth of their racks.

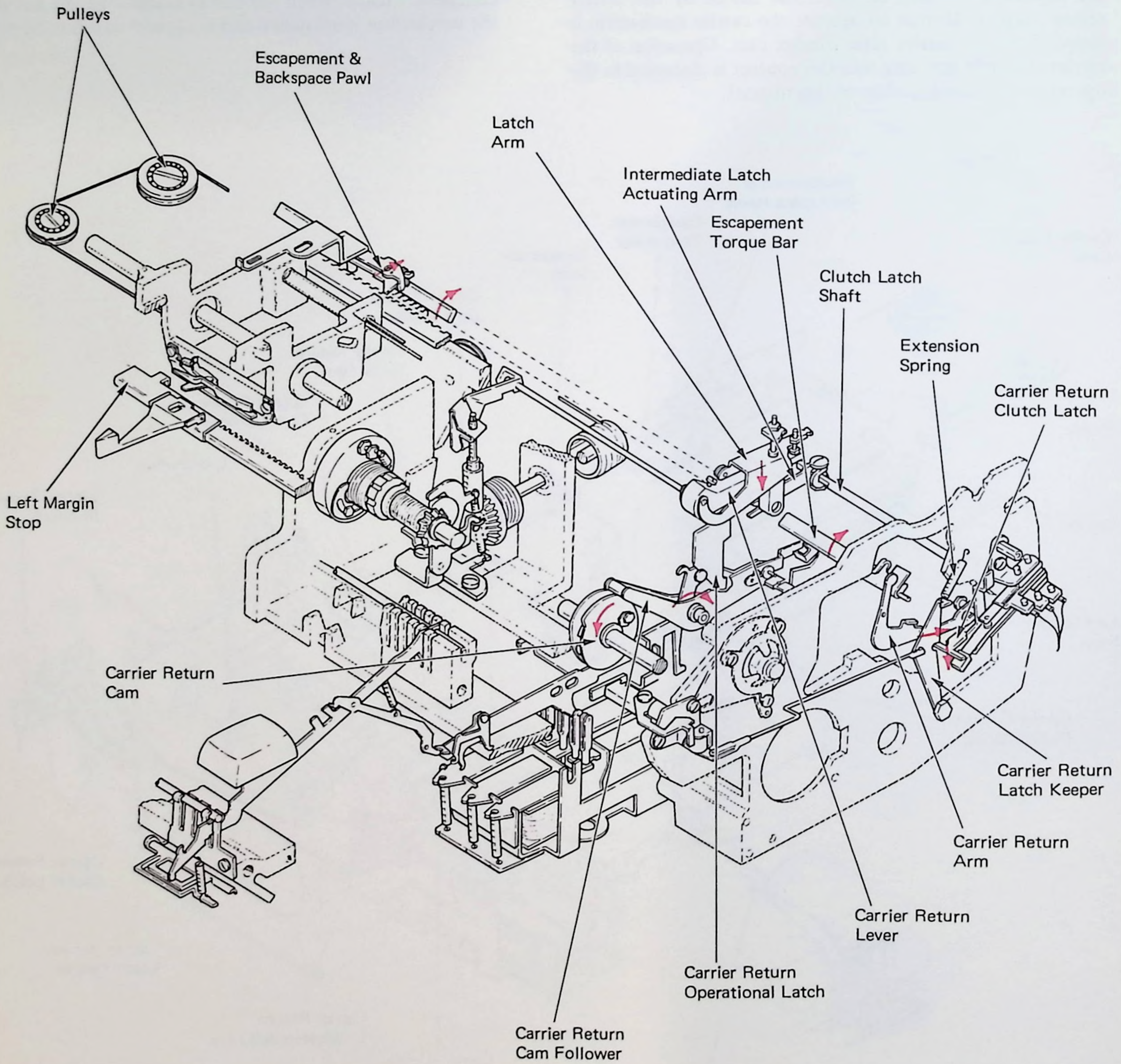


Figure 2 – Pawl Removal

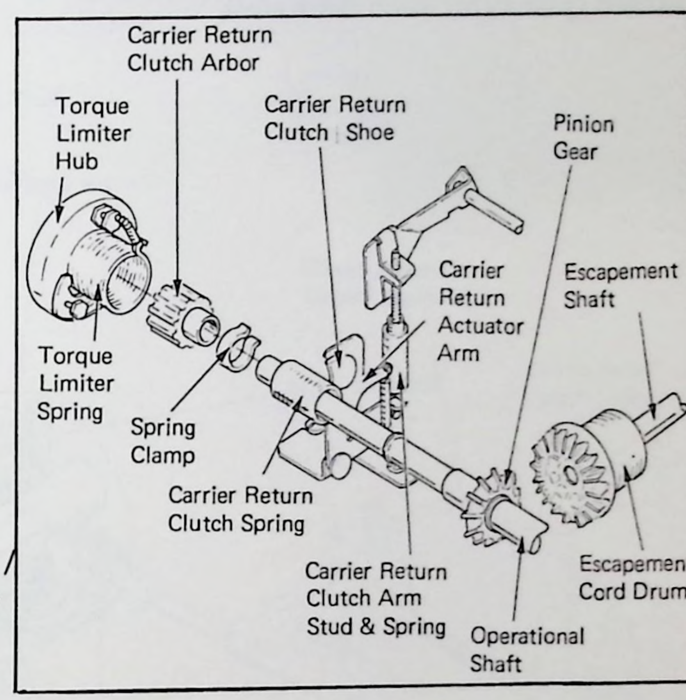
CARRIER RETURN CLUTCH OPERATION

The carrier is moved to the left margin by winding the carrier return cord onto the carrier return cord drum mounted on the rear of the escapement shaft (Figure 3). As the escapement shaft is rotated clockwise, the drum will wind up the cord and pull the carrier to the left. The carrier return cord passes from the drum to the left over a guide roller around two pulleys on the left side of the machine and hooks to the bottom of the carrier.

Power to turn the escapement shaft is supplied by the operational shaft through the carrier return clutch.

The carrier return clutch is a spring clutch consisting of a clutch arbor, clutch spring, and a pinon gear (Figure 3). The left end of the clutch spring is clamped to the clutch arbor which is in turn clamped by the torque limiter spring to the torque limiter hub, and therefore, rotates with the operational shaft. The right end of the clutch spring fits over the hub of the pinion gear. The operational shaft turns in the tightening direction of the spring, however, no drive occurs because the pinion hub is smaller than the inside diameter of the clutch spring. When the right end of the clutch spring is pressed against the pinion hub by the nylon shoe, the clutch spring will tighten around the hub and drive the pinion. The tension of the clutch spring resists any change in size and will snap back to its normal size when the external pressure is released.

The external pressure required to activate the carrier return clutch spring is applied by the nylon clutch shoe. When the carrier return operational latch is pulled down by the cam follower, the latch pulls the latch arm and the carrier return lever down. The left operational pivot pin is set screwed to the carrier return lever and pivots about its mounting hole as the carrier return lever moves downward. Located on the left end of the left operational pivot pin is the carrier return clutch arm. As the carrier return clutch arm and carrier return clutch arm stud and spring move upward, the carrier return shoe actuating arm pivots and forces the carrier return shoe into the clutch spring. The carrier return clutch is held in its activated state until the carrier return arm is unlatched at the left margin.



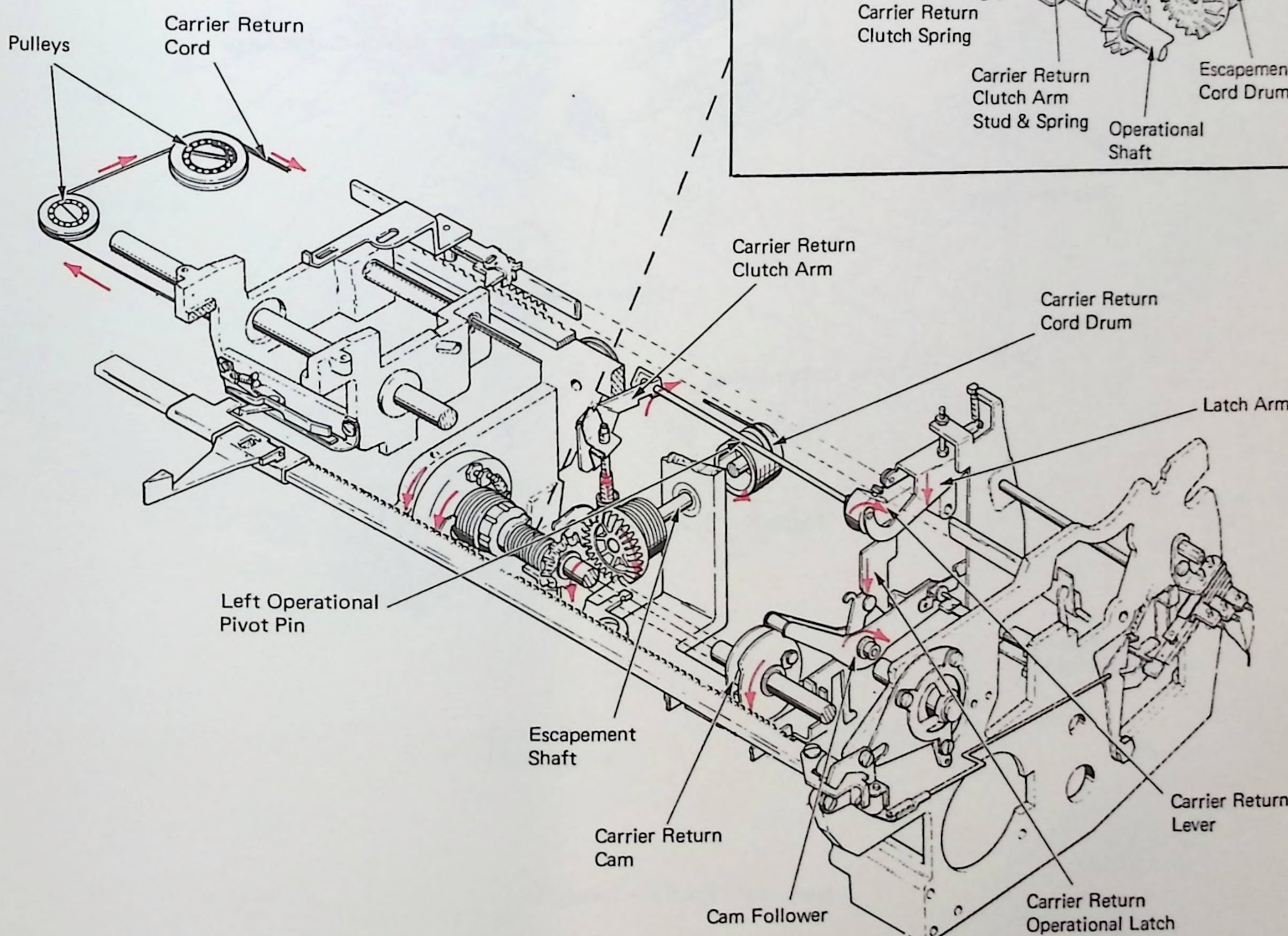


Figure 3 – Carrier Return Clutch Operation

TORQUE LIMITER

If the carrier is already resting at the left margin when a carrier return operation is initiated, the carrier return mechanism must be allowed to slip in order to reduce strain and prevent parts breakage. To accomplish this, rotational motion of the operational shaft is supplied to the carrier return clutch arbor through a torque limiter (Figure 4). The torque limiter is a spring clutch which imparts a controlled amount of force to the carrier return clutch arbor.

The torque limiter consists of the torque limiter hub, which is setscrewed to the operational shaft, and the torque limiter spring. The left end of the torque limiter spring is anchored to the torque limiter hub by an adjustable clamp. The right half of the torque limiter spring fits over the large shoulder of the carrier return clutch arbor.

The operational shaft turns in the unwinding direction of the torque limiter spring. This tends to expand it and allow it to slip. The spring, however, is heavy and considerably smaller in diameter than the carrier return clutch arbor, over which it fits. The friction present between the arbor and the spring tends to drive the arbor even though it is in the unwinding direction of the spring, but insufficient driving force is obtained from this arrangement. The right end of the torque limiter spring has a loop formed to accept an extension spring. The extension spring is connected between this loop and an eccentric stud on the torque limiter hub. The extension spring increases the force required to unwind the torque limiter spring so that no slippage occurs during normal carrier return. The torque limiter spring slips when the carrier cannot move to the left. It also slips at the beginning of a carrier return operation to allow smooth acceleration and prevent an erratic start.

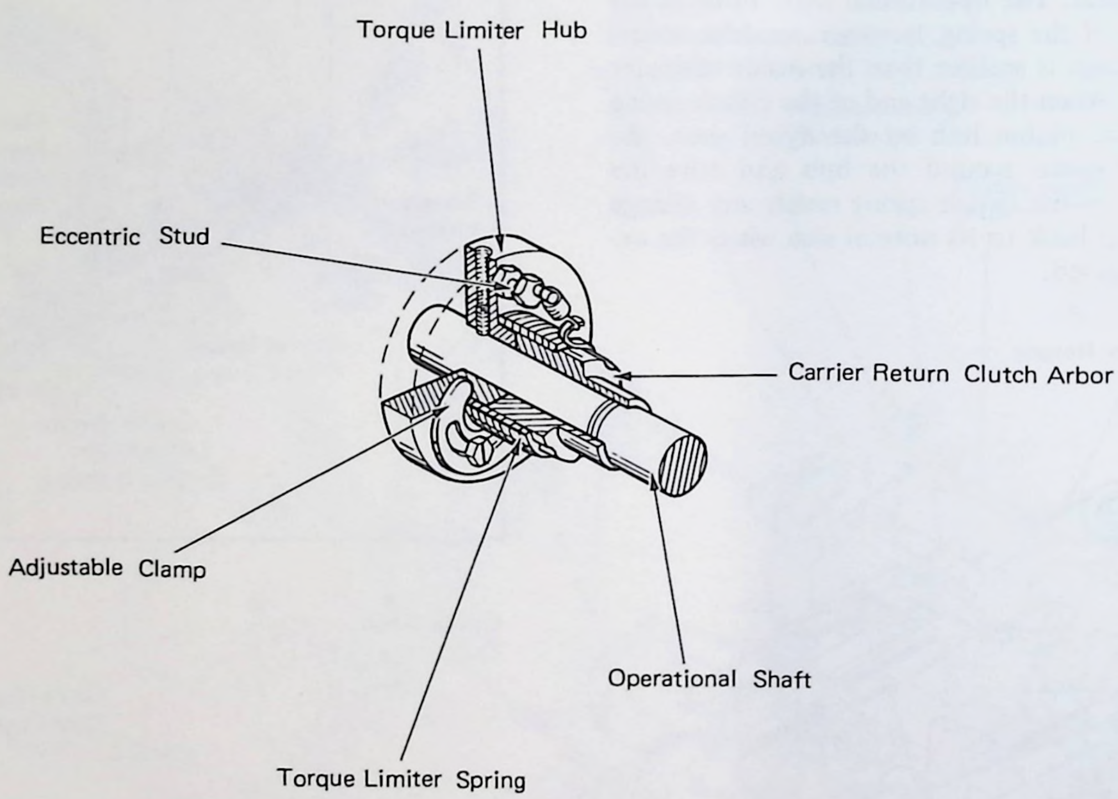


Figure 4 – Torque Limiter

CARRIER RETURN UNLATCHING

When the carrier reaches the left margin, the carrier return clutch must be unlatched and the pawls returned to their racks, ready for the next operation. This is accomplished through the stop latch which transfers motion from the carrier through the margin rack to unlatch the carrier return mechanism (Figure 5).

When the carrier is away from the left margin, a compression spring, located at the left end of the margin rack, loads the rack to the right. As the carrier is returned to the left margin, the stop latch strikes the left margin stop, forcing the margin rack to the left. Motion is then transferred through the overbank guide, a bellcrank and an unlatching link to pull the latch keeper forward, unlatching the carrier return arm assembly. As the carrier return mechanism unlatches, the escapement torque bar will return to rest allowing the pawls to return to their racks and the nylon shoe will return to rest disengaging the carrier return clutch.

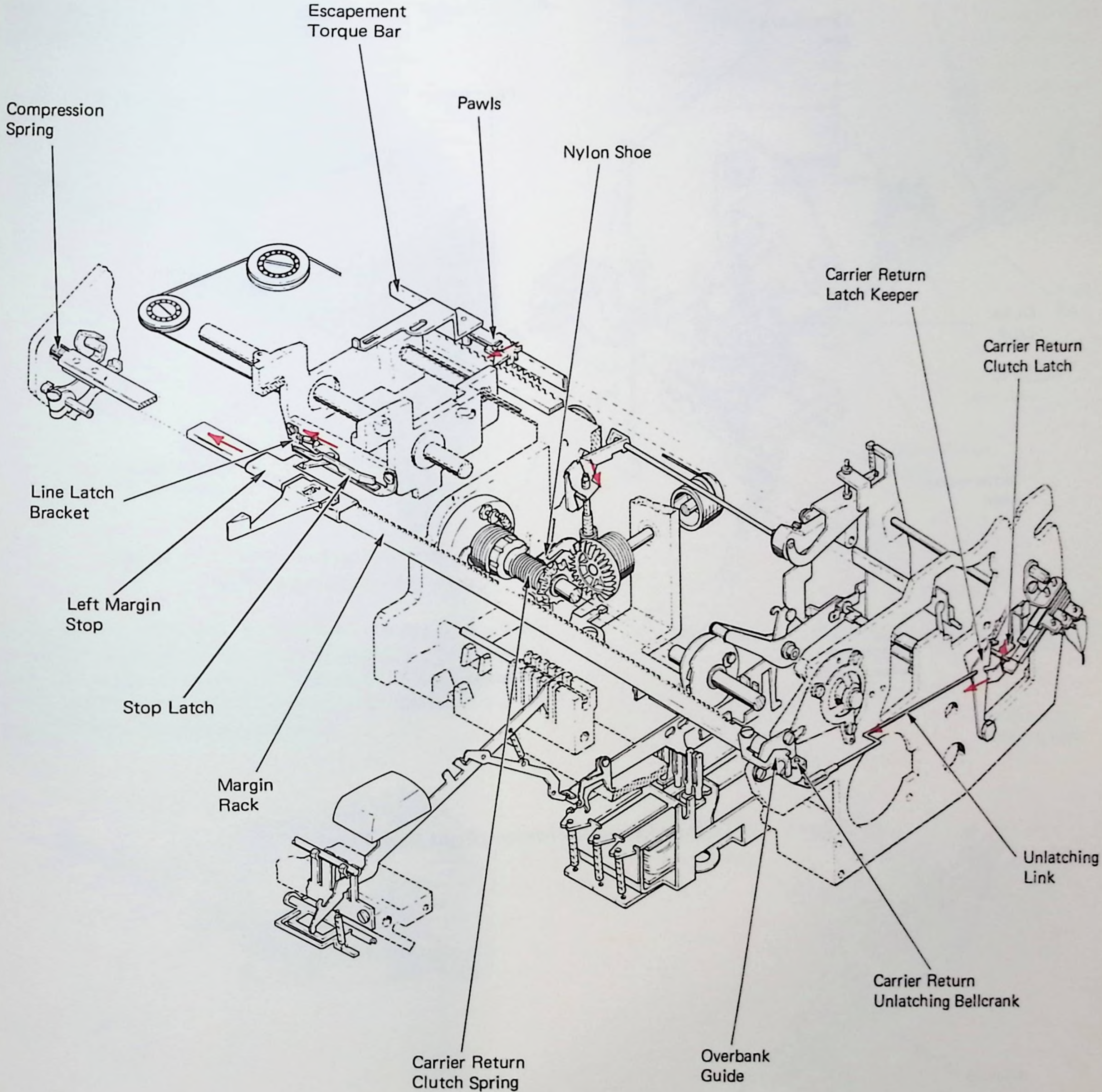


Figure 5 – Clutch Unlatching

7X1 CARRIER RETURN MECHANISM

The carrier return mechanism on 7X1 machines is basically the same as the mechanism just described. The two main differences between the mechanisms are that the carrier return clutch arm is mounted directly to the latch actuating arm pivot pin and that the latch arm assembly is not set-screwed, but is allowed to pivot on the pivot pin (Figure 6).

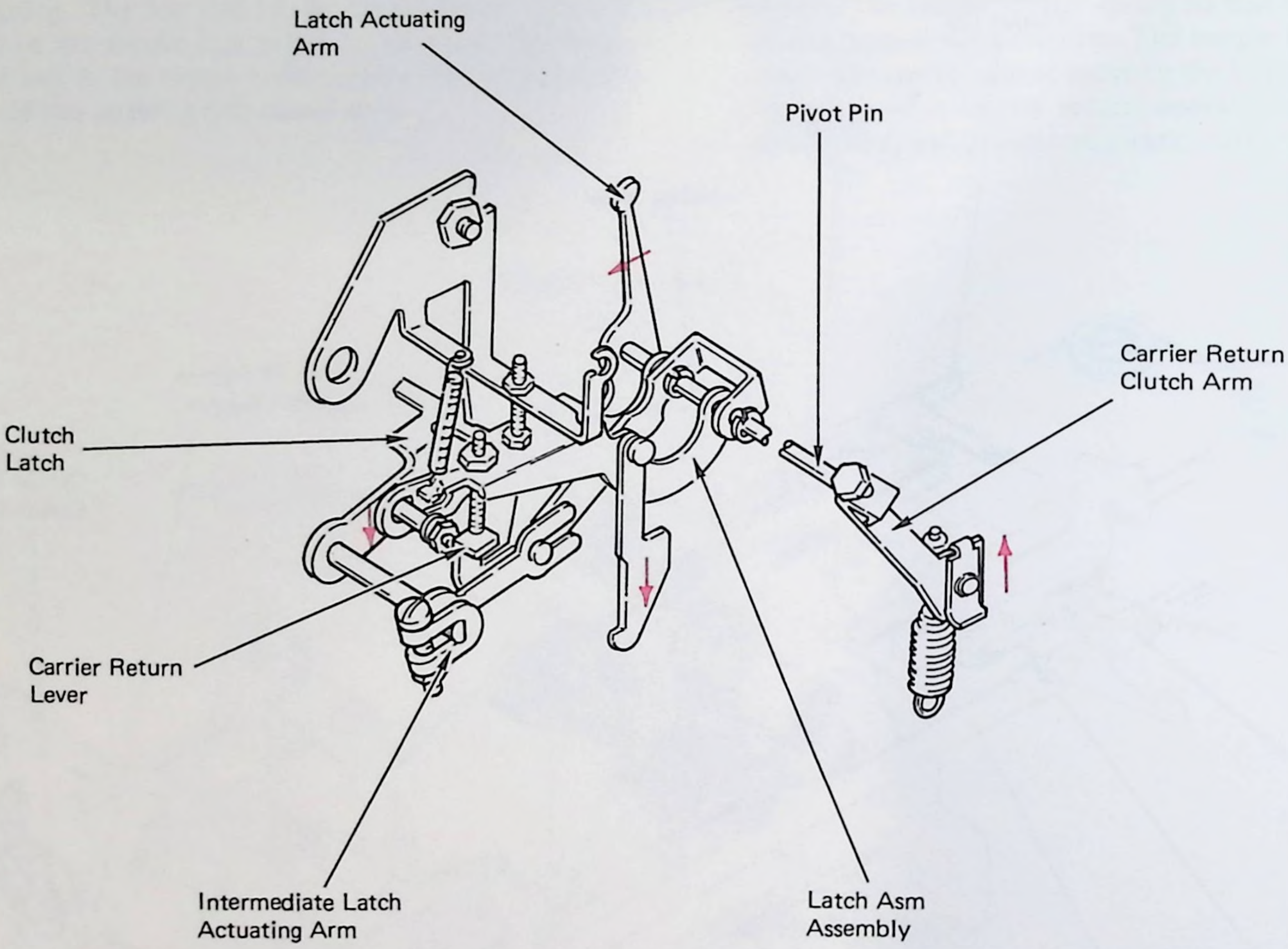


Figure 6 – 7X1 Carrier Return Mechanism (Right Rear View)

CARRIER RETURN INTERLOCK

The amount of time required to complete a carrier return operation is dependent upon the distance the carrier is from the left margin. The carrier return interlock contact should be used during output from the connected electronic device to gate succeeding cycles. This will ensure the carrier has reached the left margin and unlatched the carrier return mechanism before the next output cycle begins.

The interlock contact is operated by an extension on the carrier return clutch latch (Figure 7).

When the latch is in its rest position, the contact is in its normal position.

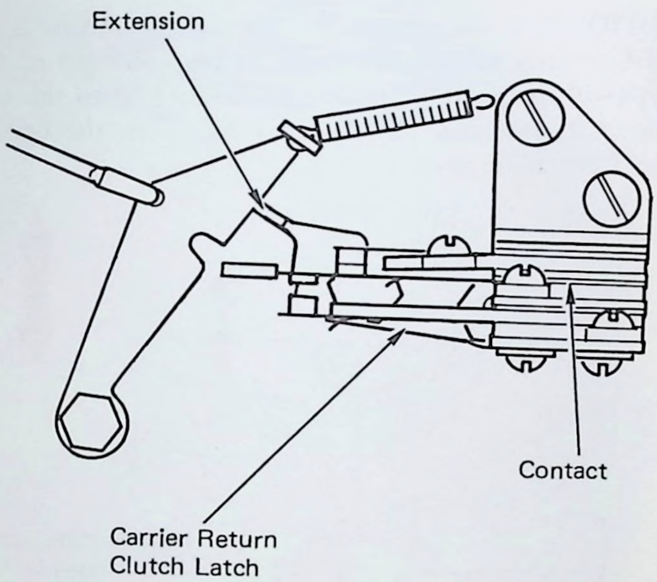


Figure 7 – Carrier Return Interlock Unlatched (Right Side View)

As the latch is operated, the extension moves down, transferring the contact. In the latched position the extension holds the contact transferred (Figure 8). When the carrier return operation is completed, the latch unlatches and the contact returns to normal position.

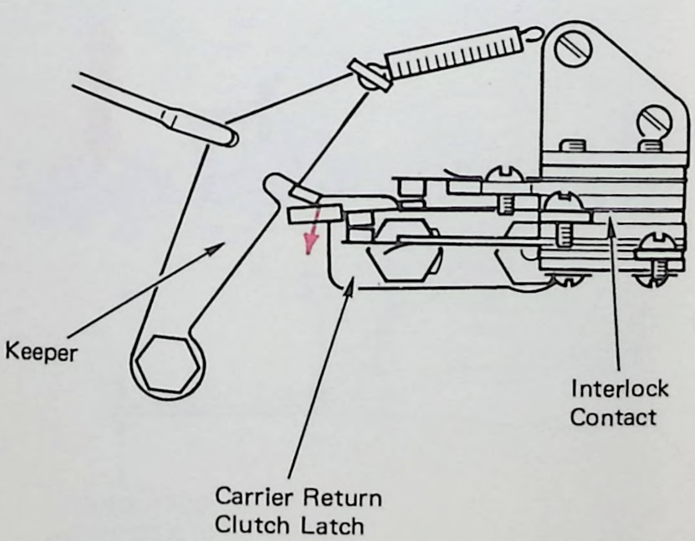
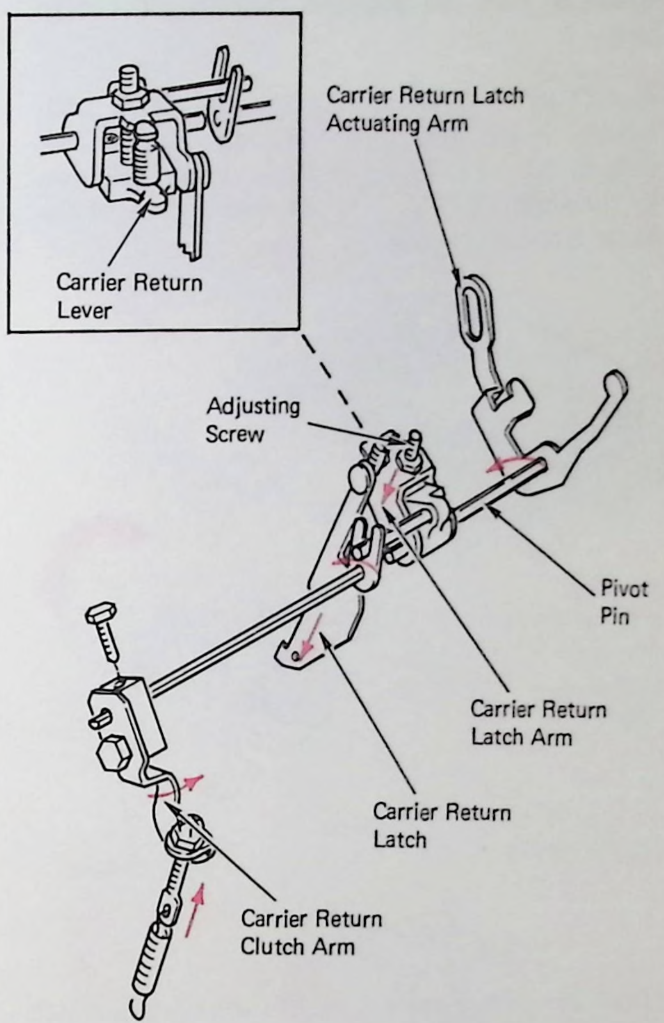


Figure 8 – Carrier Return Interlock Latched (Right Side View)

There are two levels of carrier return mechanisms. The mechanisms just described are the level 2. The level 1 mechanism operates in the same manner as level 2, but differs in part design and method of adjustment. The 7X5 and 7X1 level 1 mechanisms are shown in Figure 9 for reference purposes.



(Rear View – Left To Right) (7X1 – Level 1)

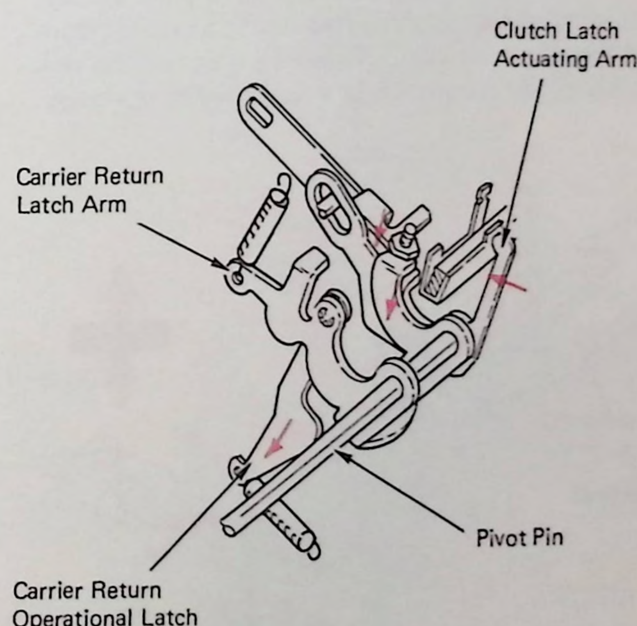
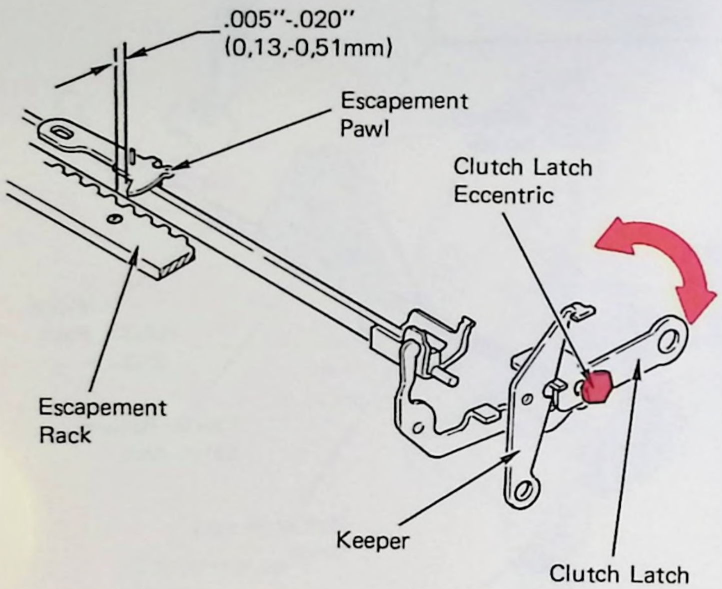


Figure 9 – Carrier Return Mechanism (Rear View – Left To Right 7X1 – Level 1)

NOTE: All operational adjustments must be correct before attempting to make carrier return adjustments. (Refer to Operational Control Section). Level 1 machines can be identified by the absence of the intermediate latch actuating arm on both 7X1 and 7X5 "Selectric" I/O Typewriters.

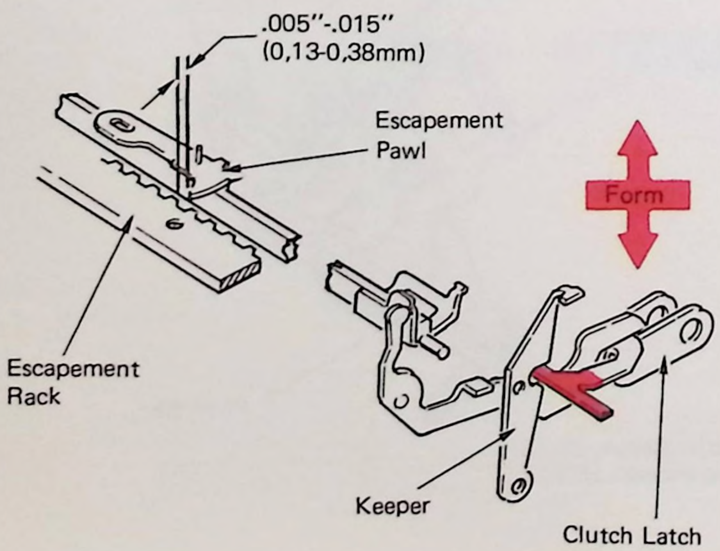
1. *Pawl Clearance (Level 1)* – Adjust the clutch latch eccentric so the escapement pawl will clear the rack teeth by .005"-.020" when the latch is being held down by the keeper. Caution: Do not form the tip of the carrier return clutch latch.



(Level 1)

(Level 2) – Form the tip of the carrier return clutch latch for .005"-.015" between the escapement pawl and the escapement rack.

This adjustment assures the escapement pawl will not drag along the escapement rack during a carrier return and that the pawl will be allowed to re-enter the rack quickly at the completion of a carrier return operation.



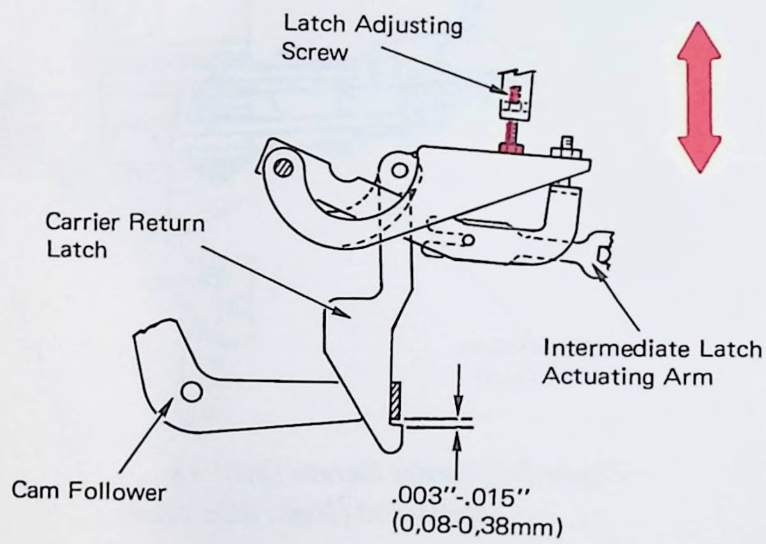
2. *Carrier Return Latch Height* – Adjust the carrier return latch adjusting screw to obtain the following conditions:

(Level 1) – .003"-.015" clearance between the carrier return latch and the cam follower.

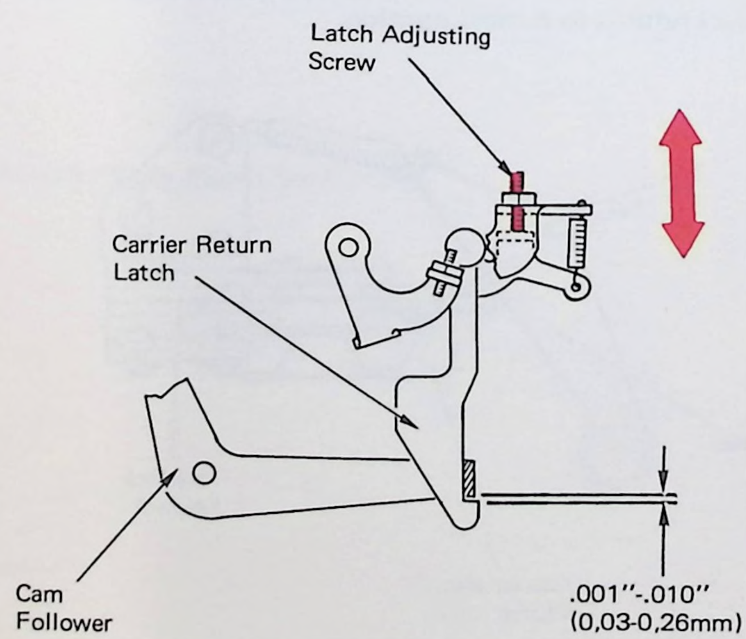
(Level 2) – .001"-.010" clearance between the carrier return latch and the cam follower.

This adjustment should be made to the low side of the spec to ensure a minimum of lost motion

CAUTION: Any change in the carrier return latch height directly affects the front to rear position of the latch (with respect to the cam follower) when the machine is at rest. See Adjustment No. 7 in the Operational Control Section.



(Level 2 – Right Side View)

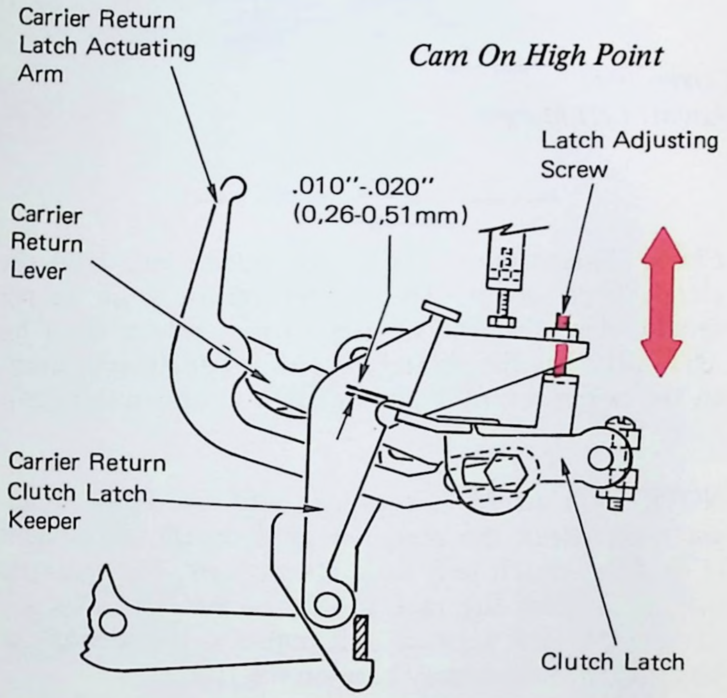


(Level 1 – Right Side View)

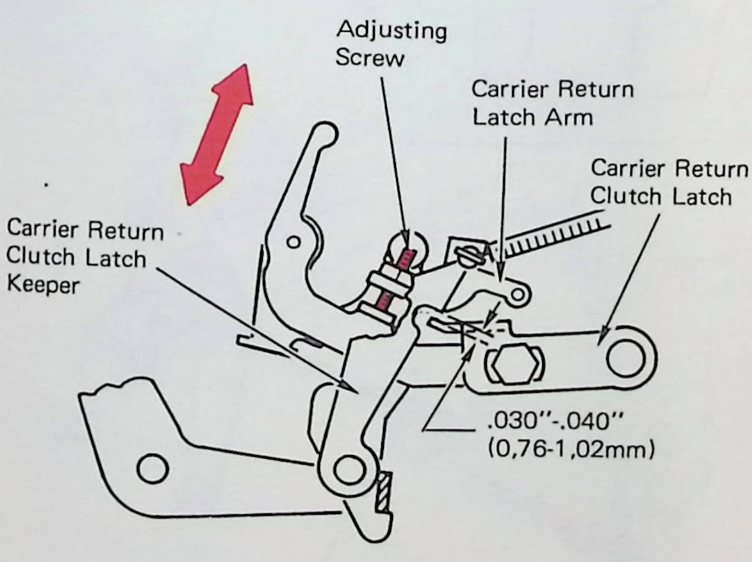
3. *Clutch Latch Overthrow (7X5 Machines)* – With the carrier return/index cam on the high point, adjust the latch arm adjusting screw in the carrier return latch arm to obtain .010"-.020" overthrow between the tip of the carrier return clutch latch and the clutch latch keeper. On 7X1 Machines this clearance should be .030"-.040".

Be sure the setscrew that locks the carrier return lever to the pivot shaft is tight as this will cause insufficient carrier return latch overthrow.

NOTE: This adjustment should be made with the platen, deflector and feed rolls in the machine. After making this adjustment, be sure to recheck adjustment No. 2.



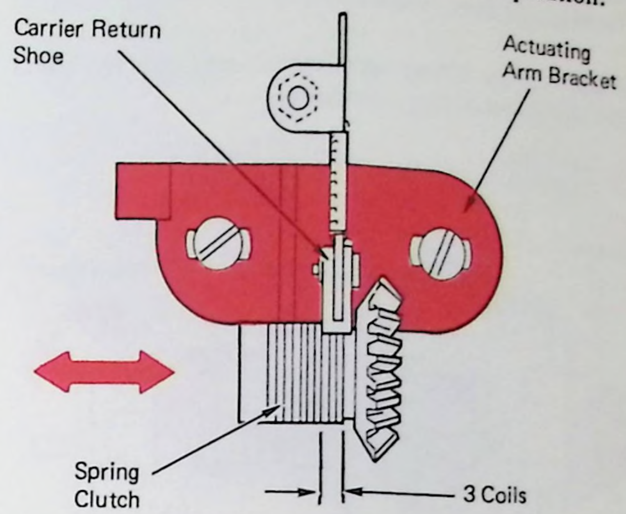
7X5
(Right Side View)



7X1
(Right Side View)

---

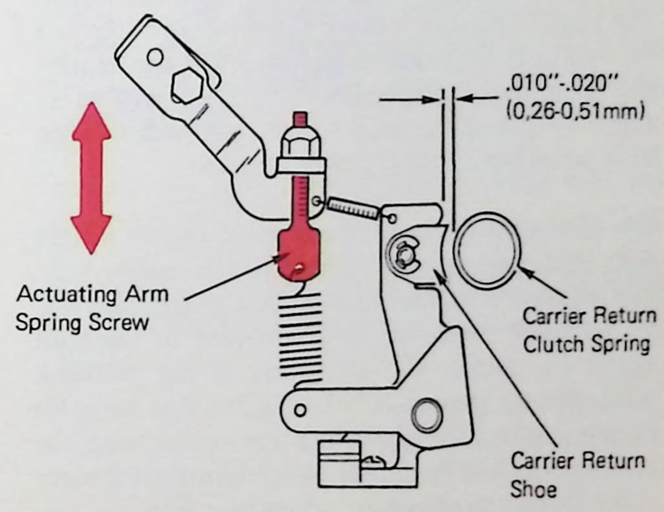
4. *Carrier Return Shoe Overlap* – Adjust the carrier return actuating arm bracket left or right so the carrier return shoe overlaps the last three coils on the right end of the carrier return clutch spring. This ensures that all coils of the clutch spring will be used in the clutch operation.



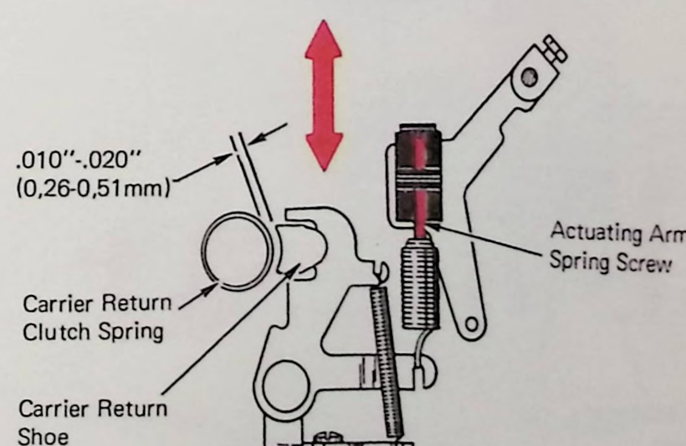
(Top View)

---

5. *Carrier Return Shoe Clearance* – Adjust the actuating arm spring screw vertically to obtain .010"-.020" clearance between the carrier return shoe and the carrier return clutch spring with all parts at rest.



(Level 1 – Left Side View)

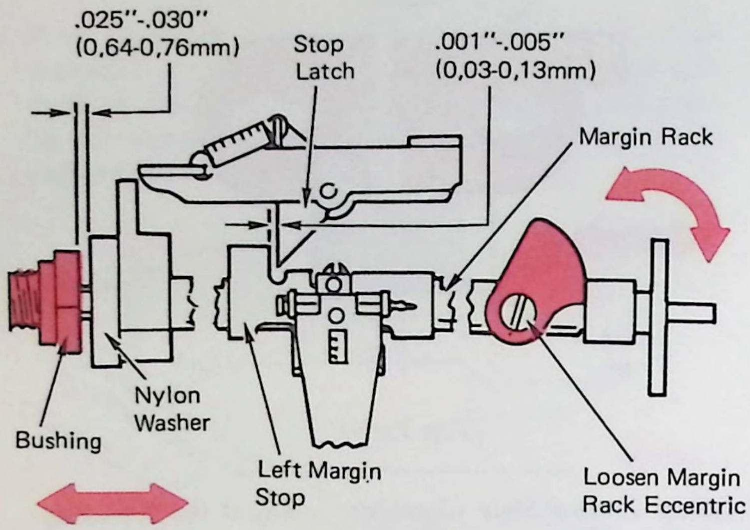


(Level 2 – Right Side View)

---

6. *Overbank (Level 1)* – With the carrier at the left margin, adjust the margin rack eccentric to obtain .001"-.005" clearance between the left margin stop and the stop latch. Next, adjust the bushing at the left end of the margin rack to obtain .025"-.030" between the bushing and the nylon washer.

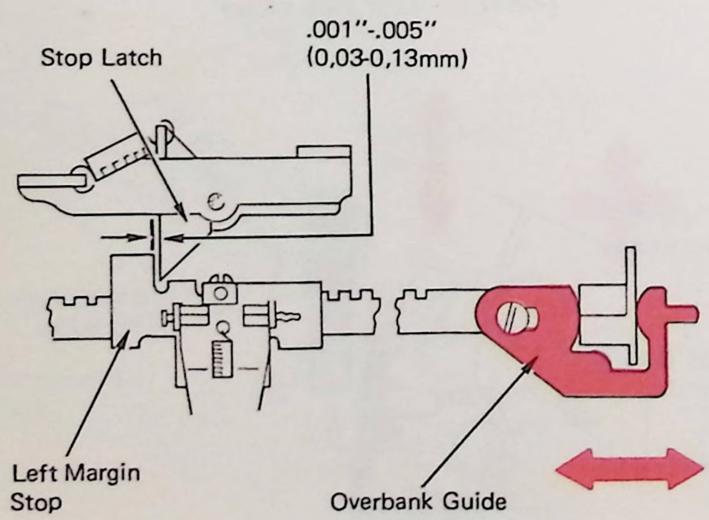
NOTE: Any change in overbank will directly affect the clutch unlatching adjustment.



(Top View)

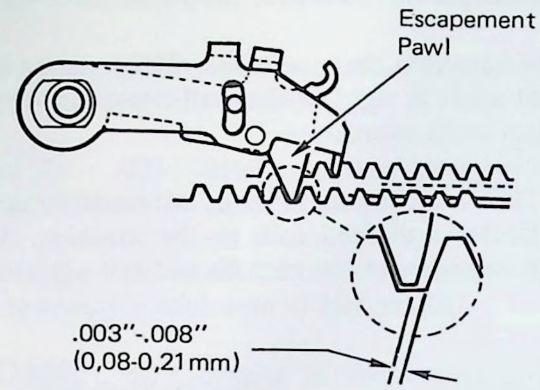
(Level 2) – With the carrier resting at the left margin, adjust the overbank guide left to right to obtain .001"-.005" clearance between the left margin stop and the stop latch. On machines equipped with the floating stop latch, the floating action of the latch must be removed by pulling the latch to the right with a spring hook before this clearance can be observed.

The adjustment of the overbank guide on the margin rack determines the rest position of the margin rack. This adjustment ensures that the left margin stop will set accurately when the stop is moved to the right against the carrier. The adjustment of the overbank guide, plus the amount of lateral motion that the guide permits, automatically provides the carrier with the overbank required for proper escapement pawl re-entry at the completion of a carrier return operation.



(Top View)

Both the level 1 and level 2 adjustment can be checked by manually holding the carrier against the left margin and into the overbank. There should be .003"-.008" clearance between the escapement pawl and its tooth when these adjustments are correct.



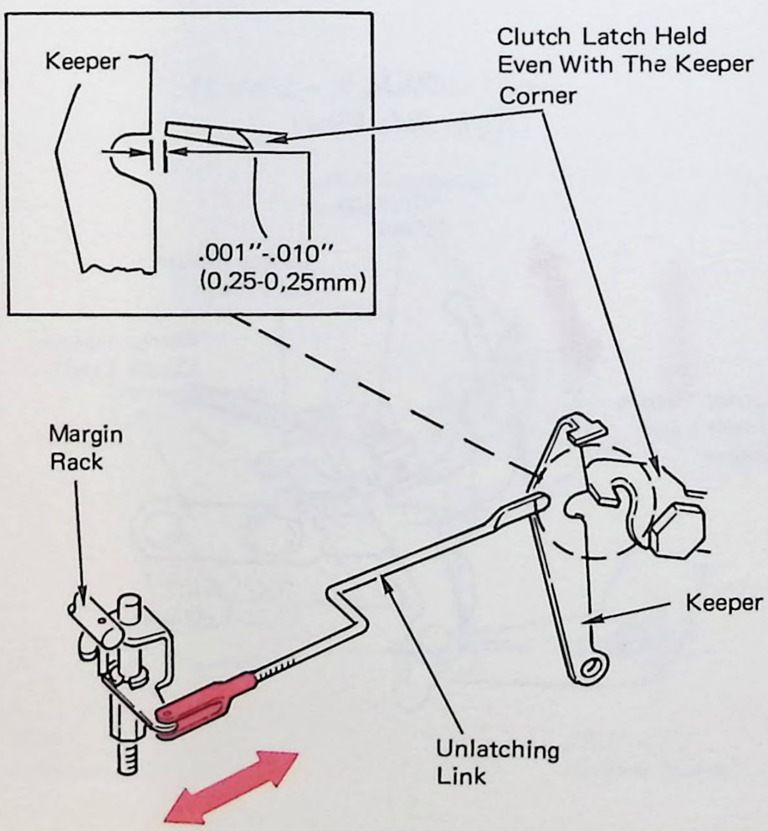
Carrier Held Against Left Margin

(Top View)

---

7. *Clutch Unlatching* – With the power on, hold the clutch latch down. The carrier return latch keeper should clear the tip of the carrier return latch by .001"-.010" at the unlatching point. Lengthen or shorten the carrier return unlatching link to obtain this clearance.

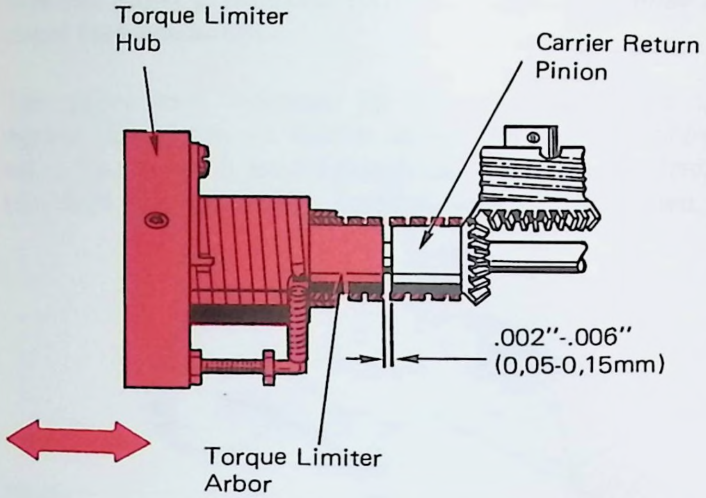
NOTE: On machines equipped with the Level 1 margin rack, check the margin rack eccentric adjustment (# 6) if the clutch fails to latch properly. The eccentric may be holding the rack too far to the left restricting the margin rack motion and reducing the amount of bite that the keeper may take on the latch.



(Right Side View)

---

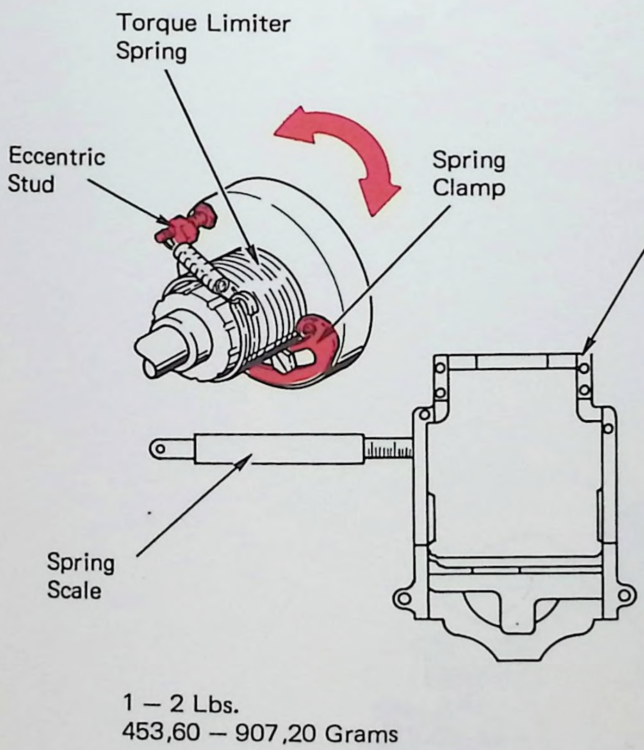
8. *Carrier Return Pinion End Play* – Adjust the torque limiter hub left or right so there is .002"-.006" clearance between the carrier return pinion and the torque limiter arbor.



(Top View)

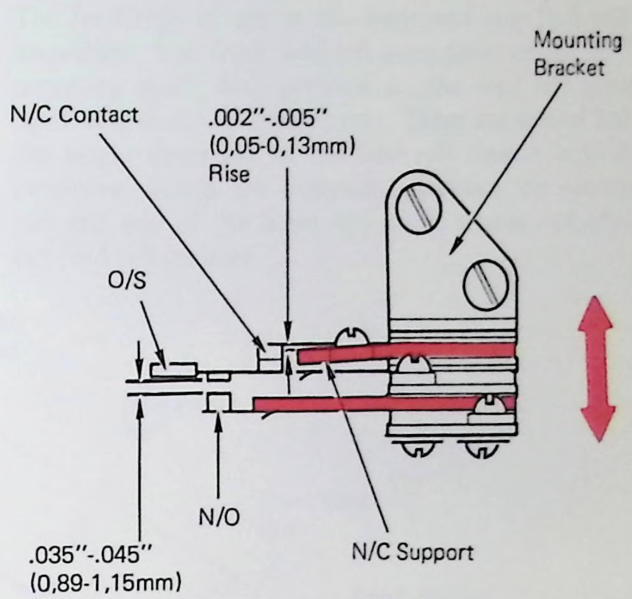
9. *Torque Limiter* – Adjust the eccentric stud on the torque limiter hub to provide one to two pounds pull on the carrier as the carrier is unlatching the clutch at the left margin. If sufficient adjustment is not available at the eccentric, the torque limiter spring may be shifted on the torque limiter hub by repositioning the torque limiter spring clamp.

If no spring scale is available, the torque may be estimated by holding the carrier while the clutch is engaged. The torque limiter should slip readily yet return the carrier positively without any hesitation when the carrier is released.



(Top View)

10. *Carrier Return Interlock Contact* – Form the normally closed (N/C) support so the operating strap O/S lifts the N/C contact .002"-.005". Form the Normally open (N/O) support so the O/S clears the N/O contact by .035"-.045".

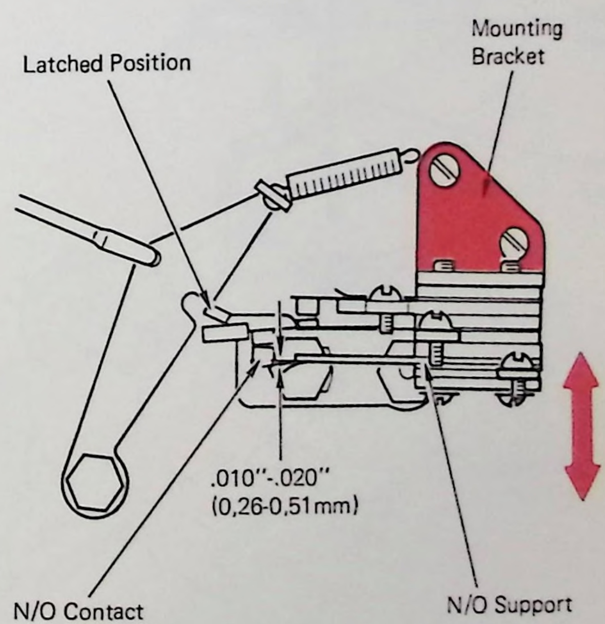


(Right Side View)

11. *Carrier Return Interlock Position* – Position the interlock contact so the N/O contact rises .010"-.020" from the N/O support when the carrier return latch is being held by its keeper.

NOTE: Excessive rise of these contacts will cause them to bounce.

The Carrier Return Interlock Contacts N/O point should make at 200 degrees ± 20 degrees of the carrier return cycle.



(Right Side View)

In this section we will discuss how the paper is held firmly against the platen, both vertically and horizontally, and how the paper is indexed vertically. First, let's look at the paper feed mechanism.

The paper feed operates by pressing the paper tightly against the platen so that it must move as the platen rotates. The paper is held against the platen by the front and rear feed roll assemblies located beneath the platen. Each feed roll assembly contains three or four rubber rollers equally spaced along and molded to the shaft (Figure 1).

The feed rolls mount in the front and rear feed roll arm assemblies. The front feed roll arms pivot on the feed roll actuating shaft. Also pivoting on the feed roll actuating shaft is a feed roll tension arm. There are several holes in the upper extension of the feed roll tension arm. Heavy extension springs are connected between the carriage tie rod and one of the holes to provide a means of adjusting the feed roll pressure.

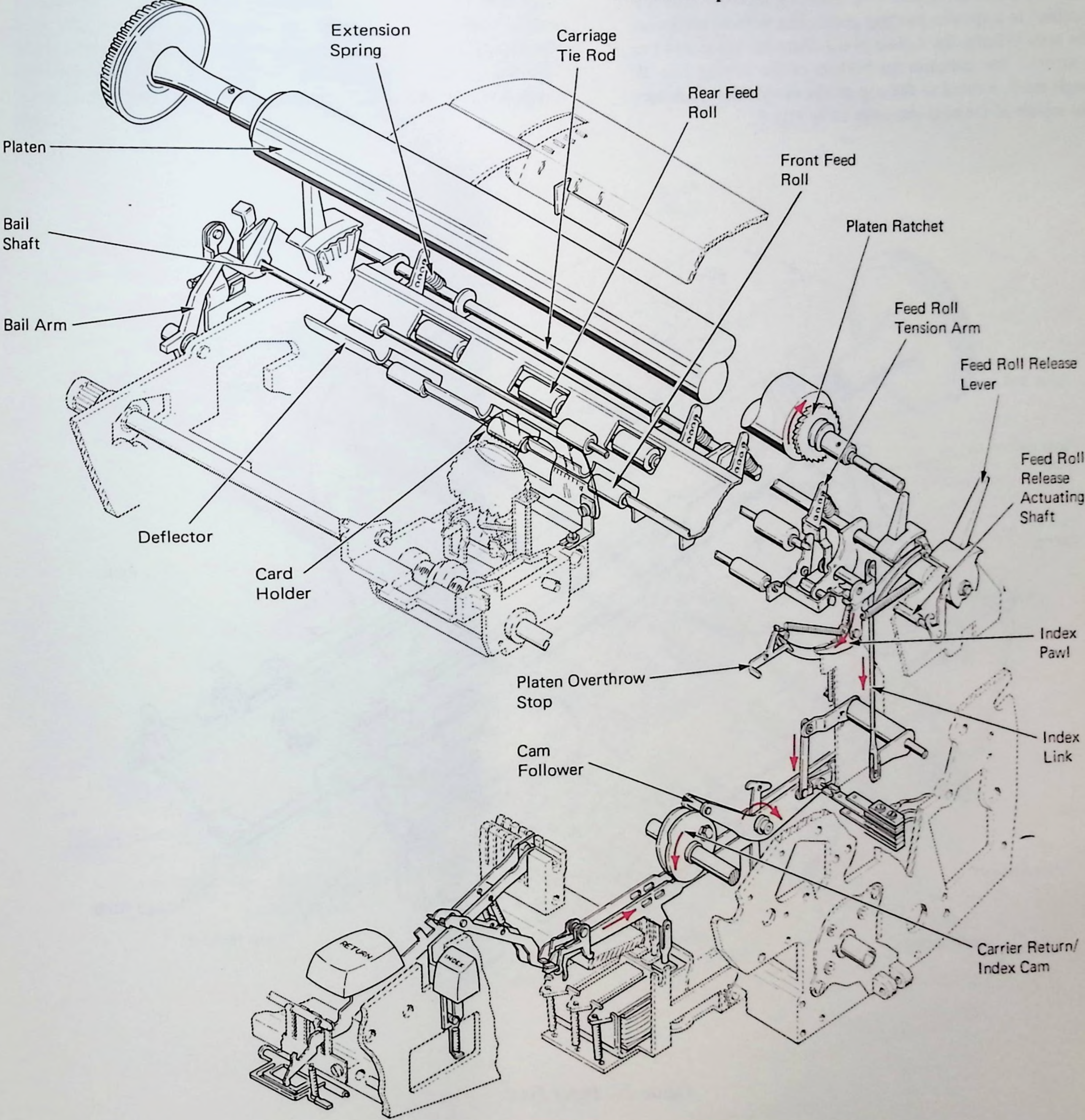


Figure 1 – Paper Feed & Index

PAPER FEED

As the paper is inserted into the machine, an adjustable guide, mounted on the center cover at the rear of the platen, serves to position the paper for its left margin position (Figure 2). The paper deflector guides the paper between the rear feed roll and the platen. As the platen is turned, the paper is forced to move with the platen. The deflector guides the paper around the platen into position between the front feed roll and the platen. As the paper is fed further, the end of the paper is guided upward by the cardholder attached to the rear of the carrier.

The cardholder assists in holding the typing material against the platen in the printing area. A scale on each side of the cardholder aids the typist in re-inserting material into the machine to a specific printing point. The vertical marks on the scale indicate the middle of the character space and the horizontal line indicates the bottom of the writing line. A single mark, located at the top of the cardholder, indicates the middle of the next character to be typed.

Above the writing line, the paper is engaged by rubber rollers mounted on the paper bail (Figure 2). These rollers hold the paper against the platen above the writing line to reduce the possibility of over printing on the paper.

The paper bail is supported by a lever at each end and pivots front-to-rear. A hair pin spring attached to each paper bail lever, serves as a toggle to hold the bail rolls either to the rear against the platen or forward in the release position.

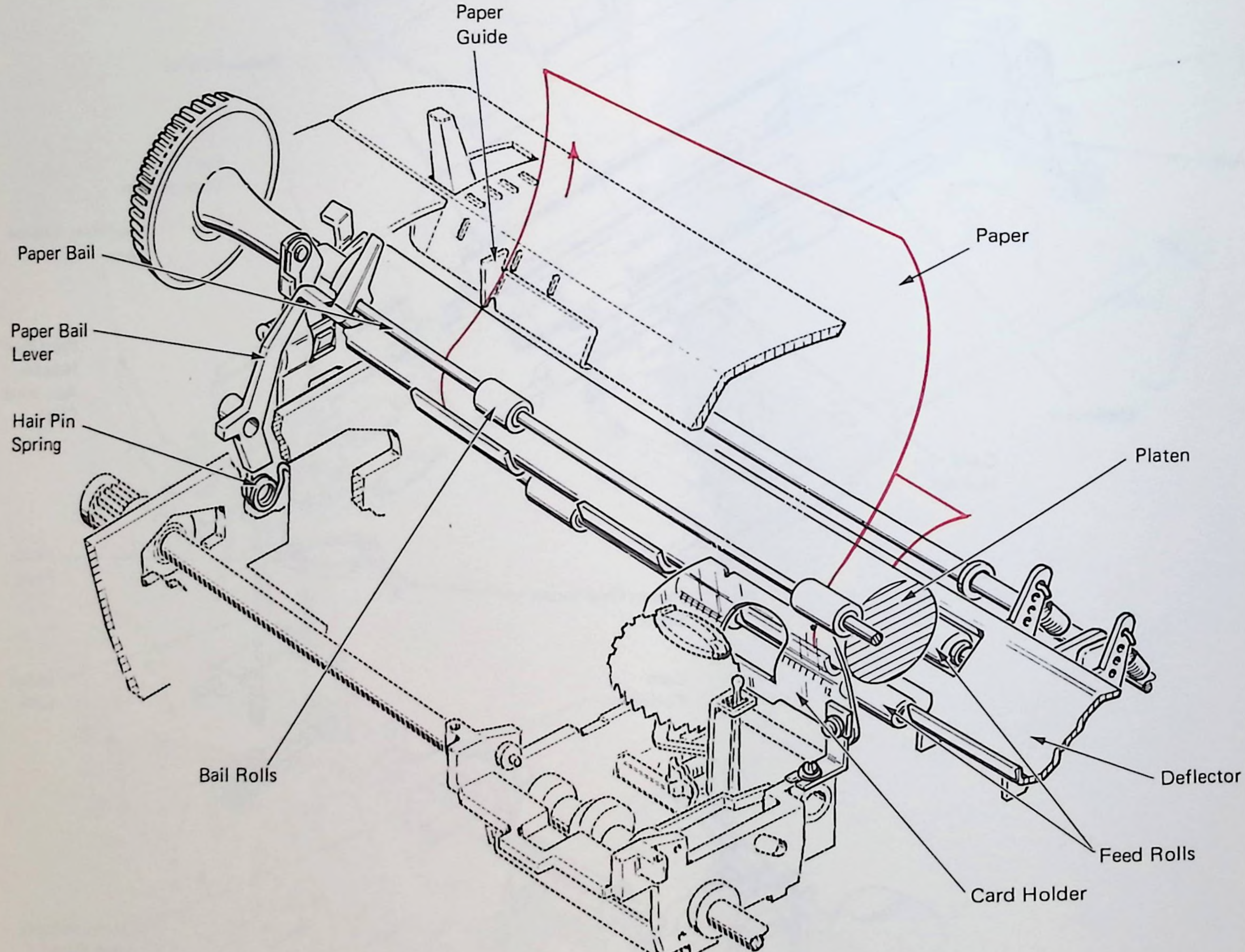


Figure 2 – Paper Feed

PAPER RELEASE

The pressure of the feed rolls is released from the platen to allow the operator to position the paper more accurately and to allow easier insertion and removal of the paper (Figure 3). Paper release is accomplished by pulling forward on the paper release lever located at the right end of the machine. The front of the paper release lever cams the feed roll release arm forward to rotate the feed roll actuating shaft. The feed roll release levers are clamped to the feed roll actuating shaft and rest behind a lug on each feed roll tension arm. As the shaft rotates, the feed roll release levers rotate the feed roll tension arms and the front feed roll arms down, away from the platen. Due to the interconnection between the front feed roll arm and the rear feed roll arm, the rear feed roll arms are forced away from the platen. When the paper release lever has been pulled all the way forward, the end of the feed roll release arm detents to hold the feed roll release lever in the released position.

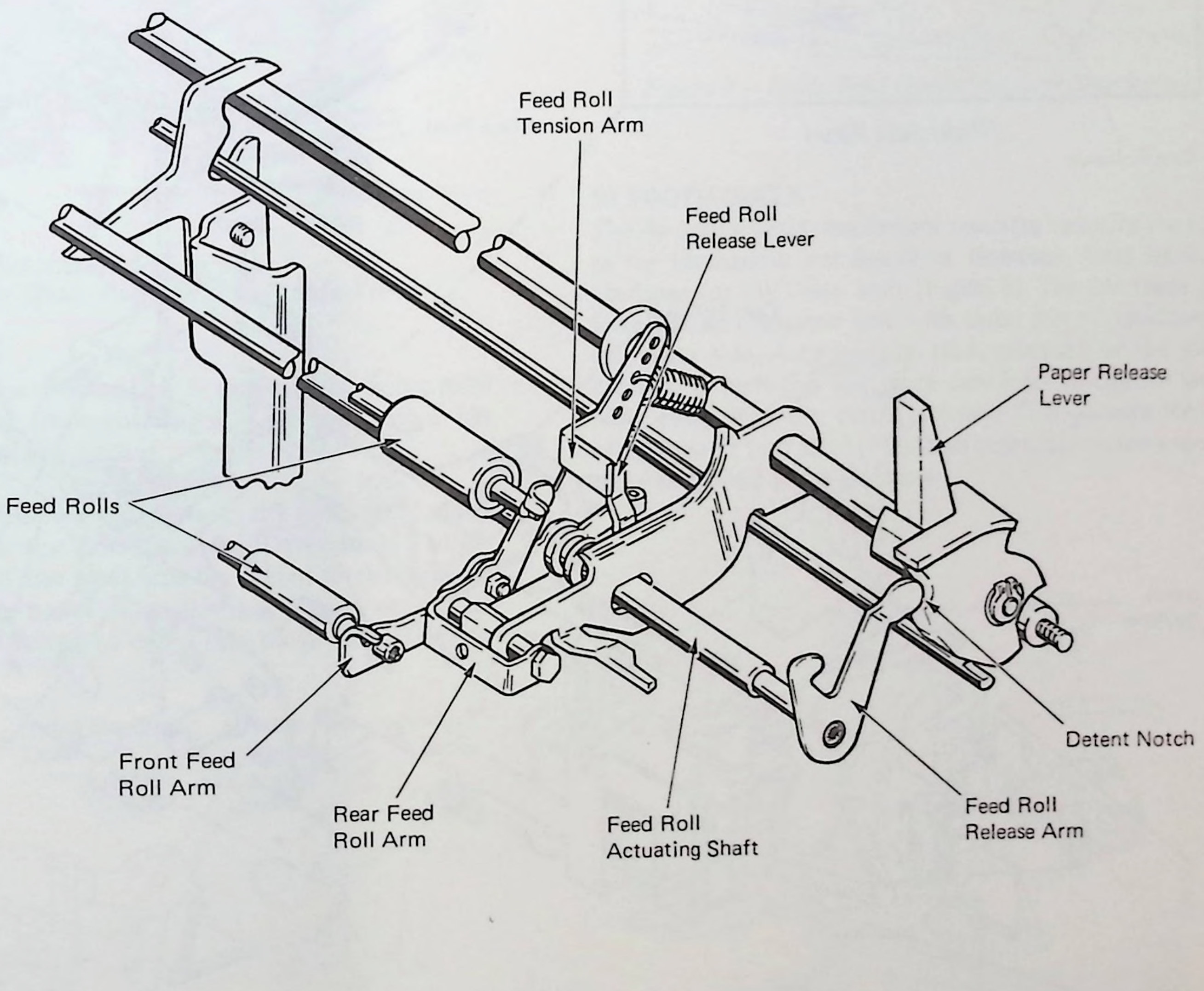


Figure 3 – Paper Release

PLATEN VARIABLE

The platen variable mechanism provides the operator with a means of rotating the platen to a position other than the normal writing line. The platen variable is used for typing permanently above or below the writing line or locating the writing line after reinserting the paper. The platen ratchet must remain stationary when selecting a new writing line. The detent roller will remain seated between the same two teeth of the ratchet at the new position. A clutch mechanism connects the ratchet to the platen so that it can be engaged for line spacing and disengaged for variable operation (Figure 9). The clutch can be disengaged by pushing the left platen knob toward the right, and as long as the platen knob is held to the right, the platen can be rotated freely while the ratchet remains stationary. When the knob is released, the clutch is automatically re-engaged by spring tension.

When the driver is disengaged from the platen end plug, the platen can be turned to the desired position. The driver can then engage different serrations and lock the platen in the new position. The left platen knob is mounted to a shaft that slides left to right inside the platen. A light compression spring holds the shaft toward the right to prevent free play. The shaft pushes against the platen driver. Movement of the left platen knob toward the right is transferred to the driver to disengage it from the platen end plug.

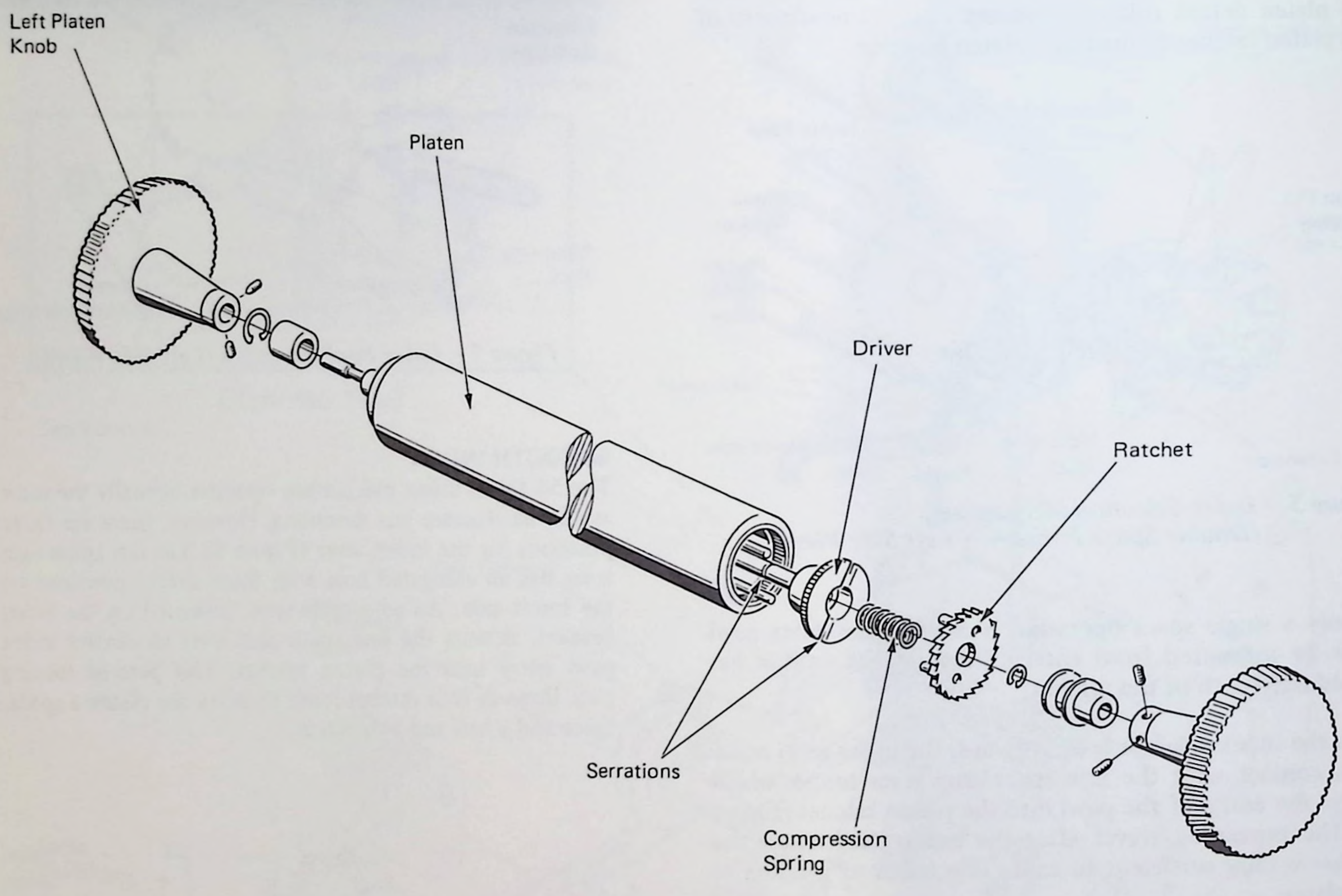
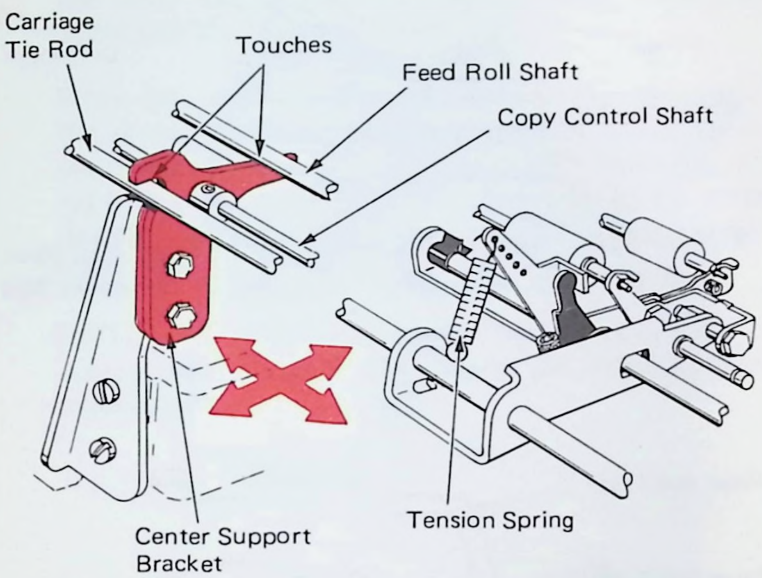


Figure 9 – Platen Variable

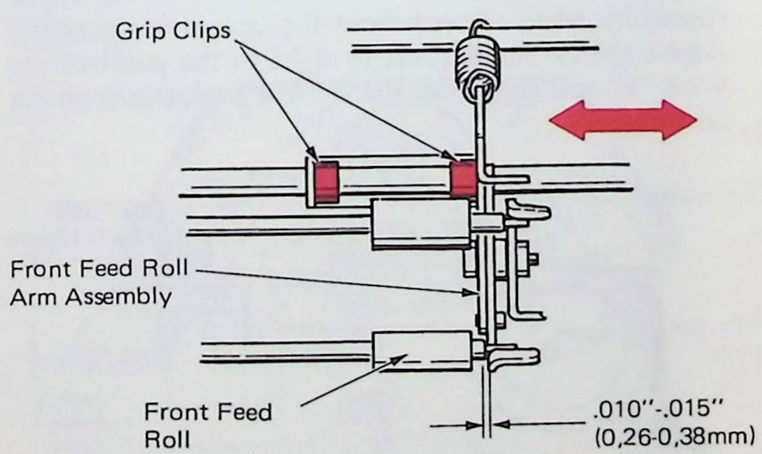
NOTE: The Platen position must be correct before any paper feed adjustments are attempted. (Print Section)

1. *Paper Feed Support* – With the feed roll tension springs disconnected, the center support bracket should be positioned so that the forward lug just touches the underside of the feed roll actuating shaft while the rear lug just touches the top of the carriage tie rod. The center support bracket should not bow the copy control shaft.



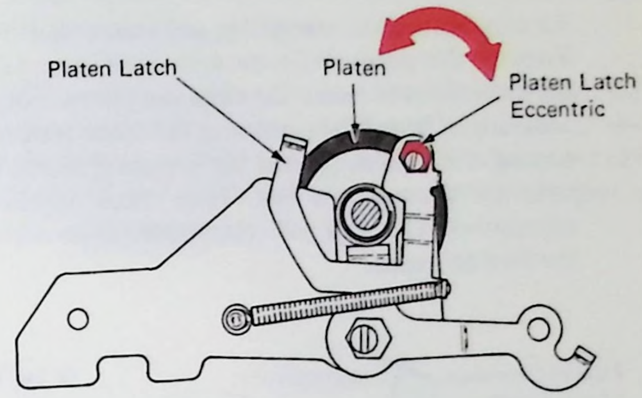
(Left Rear View)

2. *Feed Roll End Play* – The right front feed roll arm assembly on the 7X1 and the left and right front feed roll arm assemblies on the 7X5 should be adjusted by moving the grip clips on the feed roll actuating shaft to permit the feed rollers to have .010"-.015" sideplay.



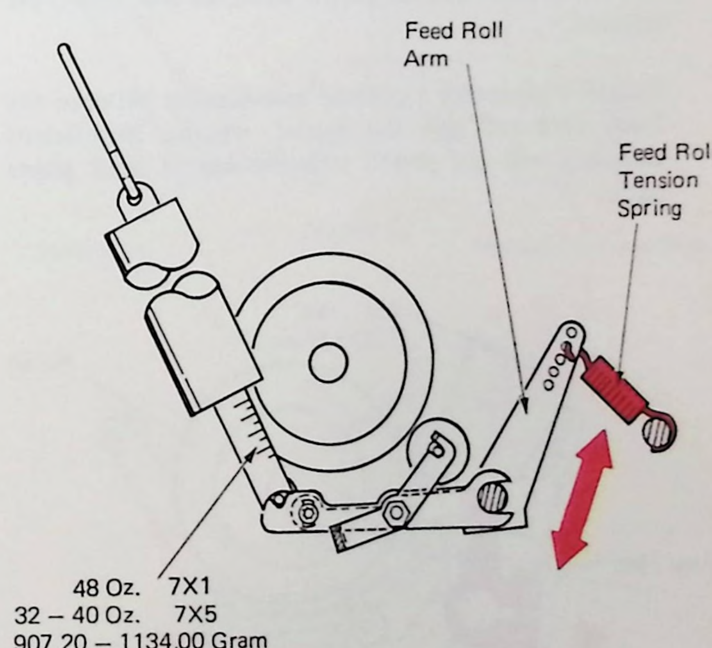
(Top View)

3. *Platen Latches* – Adjust the platen latch eccentrics with the high part up so the platen is held firmly in position vertically and front to rear. The latches should latch and unlatch freely with the feed rolls released.



(Right Side View)

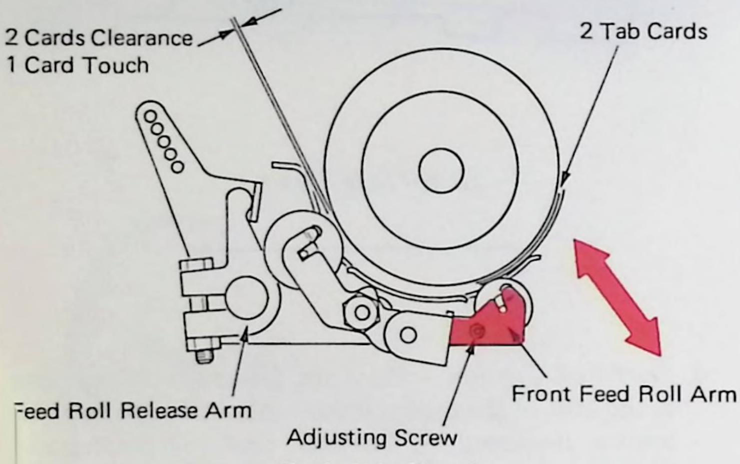
4. *Feed Roll Tension* – Place the feed roll tension springs in the hole of the feed roll arms that will provide proper tension measured at the front feed roll pivot points. The 7X1 machines should be adjusted for 3 pounds tension and the 7X5 machines should be adjusted for 2-2 1/2 pounds tension.



(Right Side View)

5. *Feed Roll Adjustment* – Adjust the front feed roll arms vertically to obtain a slight clearance between the rear feed rollers and the platen when two tab cards are between the front feed rollers and the platen. With one tab card between the front feed rollers and the platen, the rear feed rollers should have a slight drag on the platen.

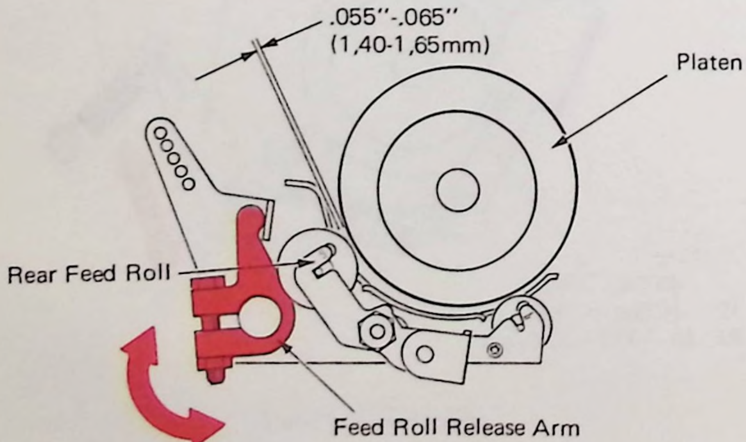
An easy method to make this adjustment is as follows: Remove the paper deflector and insert three tab cards between the rear feed rollers and the platen. Loosen the adjusting screw. While pressing the front feed roll arm toward the platen, tighten the adjusting screw. Do the same for the opposite end. Then check for the above adjustment. The feed roll release arms must not restrict the feed roll arms.



(Left Side View)

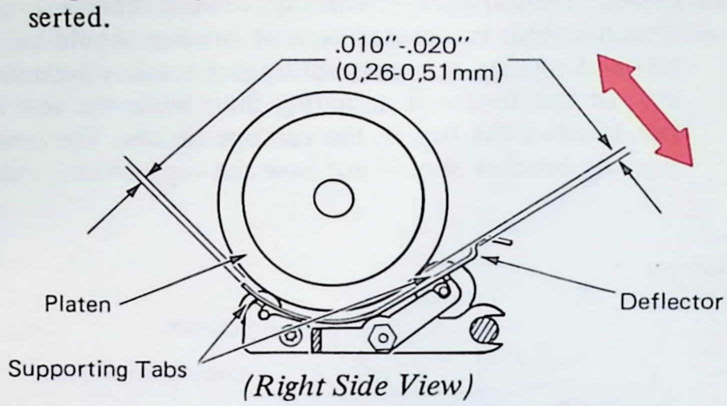
6. *Paper Release* – Adjust the feed roll release arms front to rear to obtain .055"-.065" clearance between the rear feed rollers and the platen when the feed rollers are released.

Excessive clearance can cause interference between the front feed roll and the carrier, whereas insufficient clearance will not permit straightening of thick paper packs.



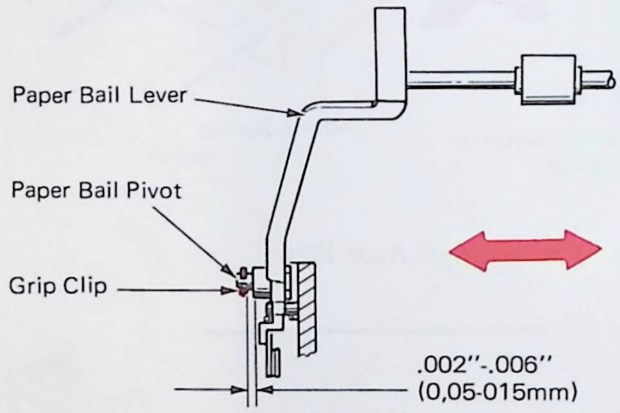
(Left Side View)

7. *Deflector* – Form the deflector supporting tabs on the front and rear feed roll arms to obtain a clearance of .010"-.020" between the deflector and the platen. Three tab cards inserted between the platen and the deflector, at the front and rear, should provide a slight drag. No drag should be felt when one tab card is inserted.



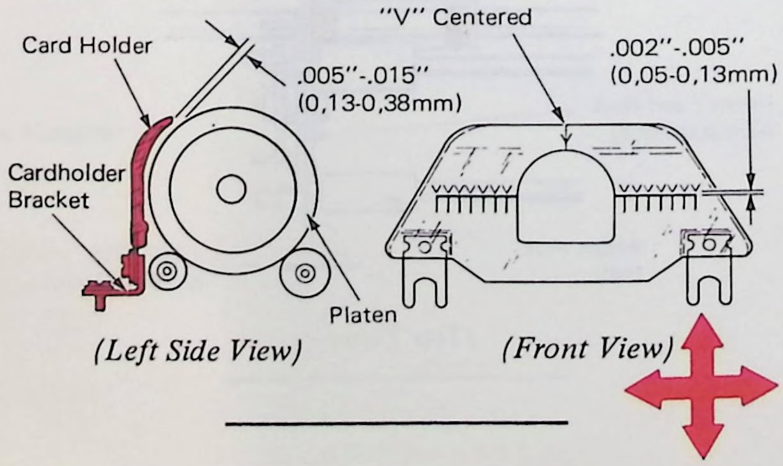
(Right Side View)

8. *Paper Bail* – Adjust the grip clip on the paper bail pivot shaft to obtain .002"-.006" end play of the paper bail lever.



(Front View)

9. *Cardholder* – With the copy control lever forward, adjust the cardholder brackets front to rear to obtain .005"-.015" clearance with the platen. The vertical adjustment should be such that the horizontal line is parallel and .002"-.005" below the feet of the typed characters when viewed from the operator's position. Adjust the cardholder left to right so the point of the letter "v" will align with the vertical graduations on the cardholder.



(Left Side View) *(Front View)*

10. *Removable Print Shield* – If installed, form the shield actuating lever to satisfy the following conditions:

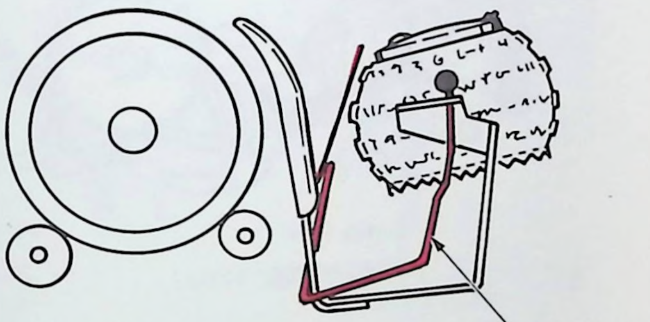
a. So the shield is against the platen when the lever is in the rear, latched position.

b. The print shield should rest against the element with the shield actuating lever in the forward or typing position. Crease the shield at the bottom if necessary to obtain this condition.

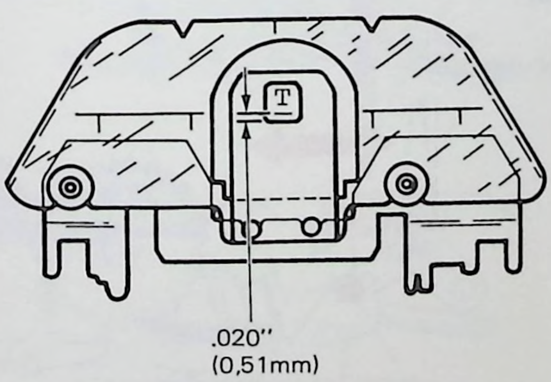
When the load lever of the film ribbon mechanism is activated, the shield will automatically be positioned to the rear. The ribbon must be installed between the shield and the typehead.

When the cardholder is adjusted for proper registration, the shield will be in the correct position. As an adjustment check, type an upper case "T" backspace and type an underscore. The "T" should be in the center and the underscore approximately .020" from the bottom of the hole.

NOTE: All operational control adjustments must be correct before attempting to make the following index adjustments.



(Left Side View)

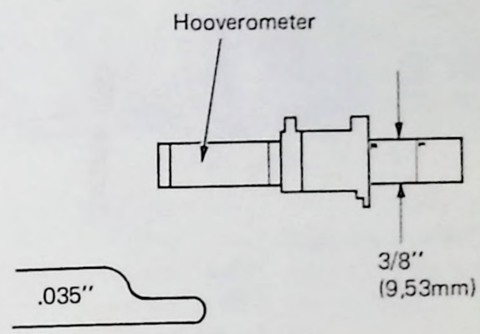


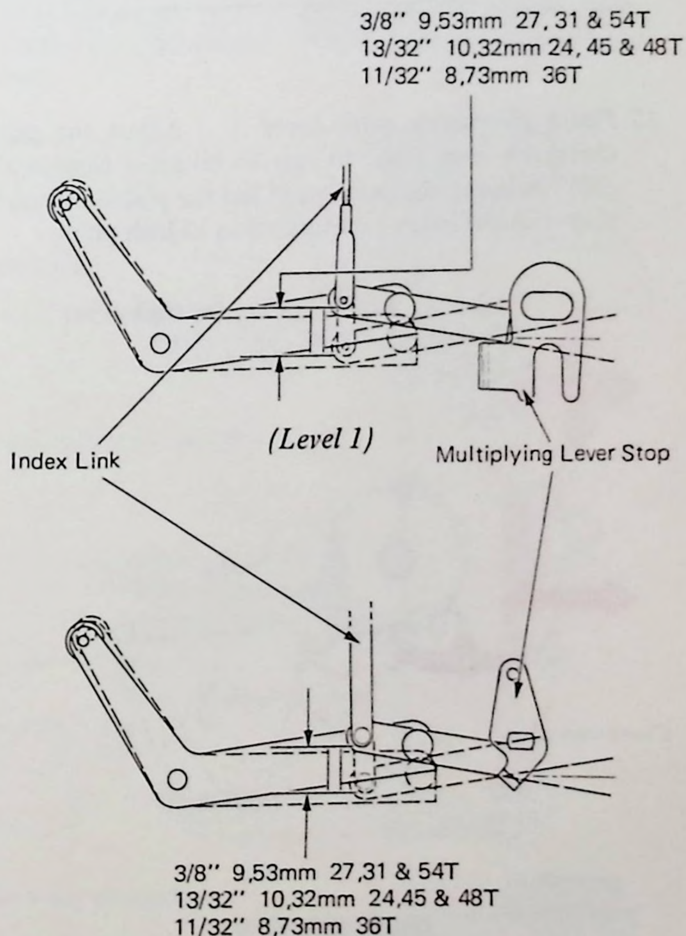
(Front View)

11 *Multiplying Lever Stop* – On machines equipped with a 27, 31, or 54 tooth ratchet, adjust the multiplying lever stop front to rear to produce 3/8" motion to the index link when the carrier return/index cam is operated to its high point (platen removed).

On machines equipped with 24, 45, or 48 tooth ratchets, adjust for 13/32" motion and with 36 tooth ratchets adjust for 11/32" motion.

NOTE: This adjustment may be measured with the hooverometer and a feeler gauge. The handle of the hooverometer is 3/8" wide. The 13/32" adjustment can be gauged by the of the hooverometer handle plus a .035" feeler gauge.

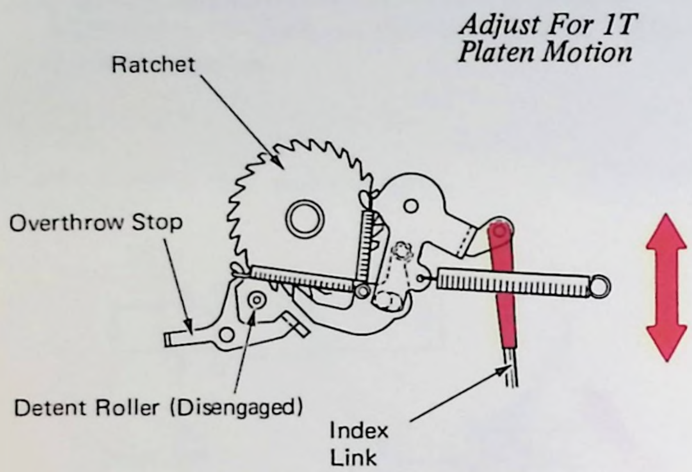




(Level 1)

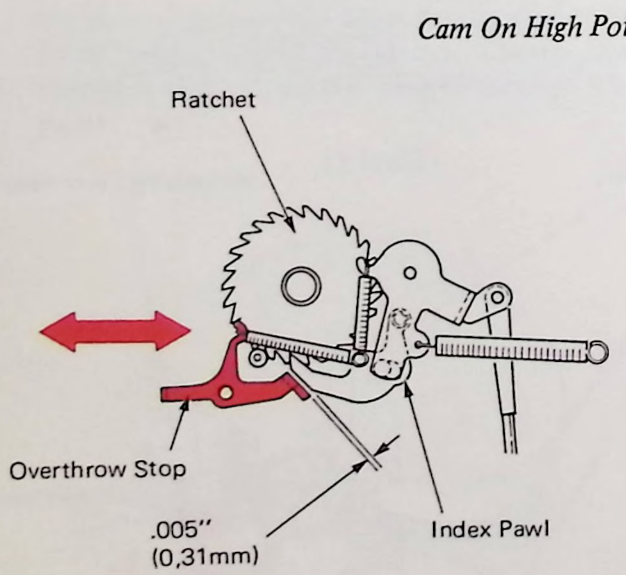
(Level 2) (Right Side View)

12. *Index Link Level 2* – As a preliminary step, loosen the platen overthrow stop and move it to the front of the machine. With the platen installed and the feed rolls engaged, hold the detent roller disengaged from the platen ratchet. Manually cycle an index operation. At the end of the cycle, allow the detent roller to re-enter the platen ratchet. If the index link is properly adjusted, the detent roller will seat between the two ratchet teeth without causing any rotational movement to the platen. Adjust the index link clevis to obtain this condition.



(Right Side View)

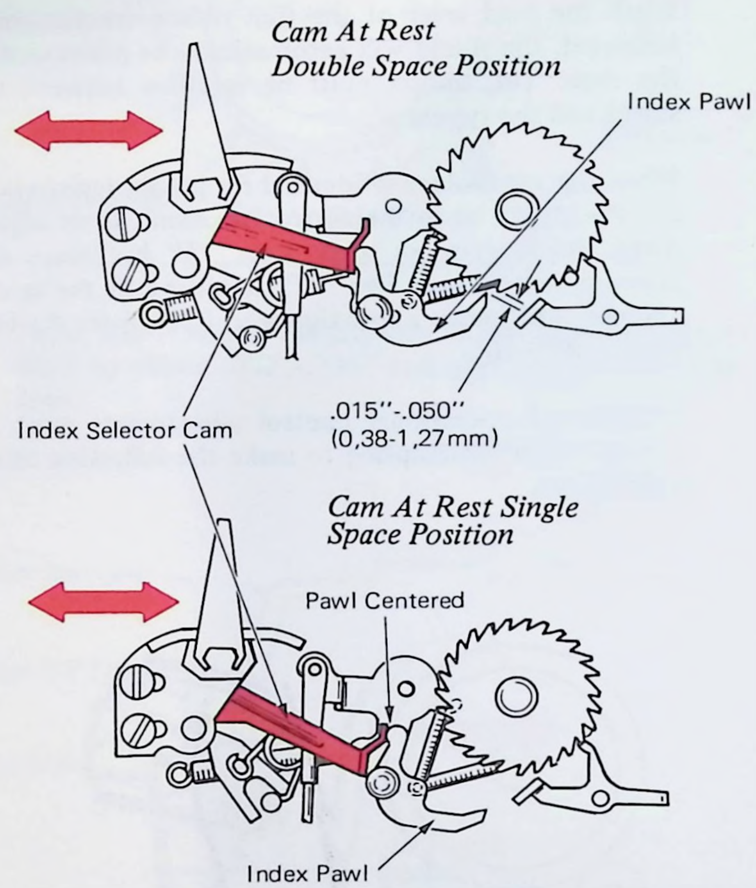
13. *Platen Overthrow Stop Level 2* – Adjust the platen overthrow stop front to rear to obtain a clearance of .005" between the index pawl and the platen overthrow stop with the index cam rotated to its high point.



(Right Side View)

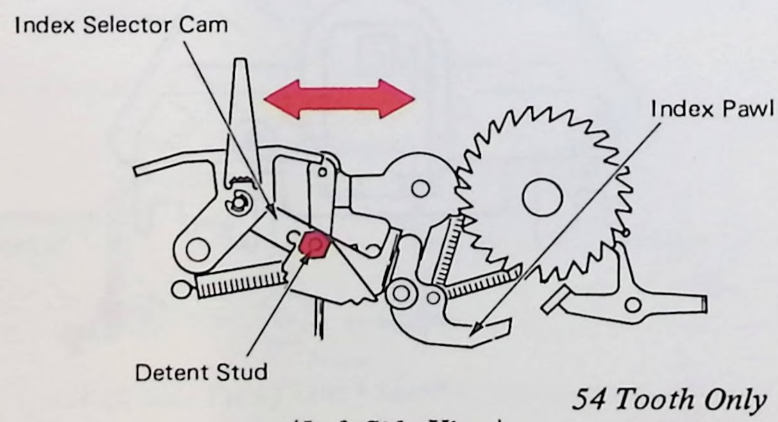
14. *Index Selector Cam Level 2* – With the index cam at rest and the index lever in the double space position, adjust the selector cam front to rear so the index pawl clears the platen ratchet by .015"-.050". With the index lever in the single space position, adjust the selector cam vertically so the index pawl is centered on the cam surface.

These adjustments must be considered together and refined until both are correct.



(Left Side View)

On machines equipped with a 54 tooth ratchet, adjust the index selector detent stud so the index pawl will reliably enter the correct ratchet tooth to produce a feed of 2,3 or 4 ratchet teeth when the index lever is placed in first, second or third index position respectively.

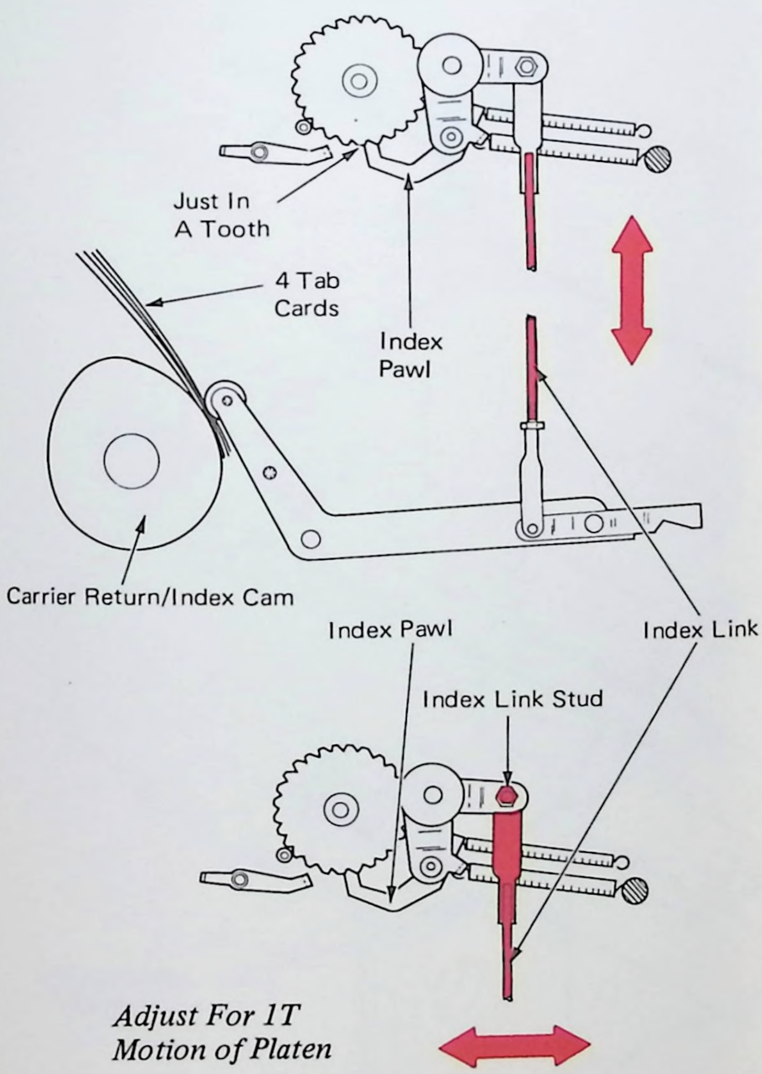


(Left Side View)

15. *Index Link and Index Stud (Level 1)* – As a preliminary setting, position the index link stud in the middle of the slot in the pawl carrier. Subsequent adjustments may require that the position be altered slightly. With the index selection lever in the single line space position and the carrier return/index cam latched at rest, insert four tab cards between the carrier return cam and the cam follower. Adjust the index link so the index pawl is bottomed in the ratchet against the tooth.

With the carrier return index cam on the high point, adjust the index stud front to rear to obtain one full tooth of motion from the index pawl after it starts to drive the platen. The upper index pawl stop must allow the index pawl to bottom in the ratchet.

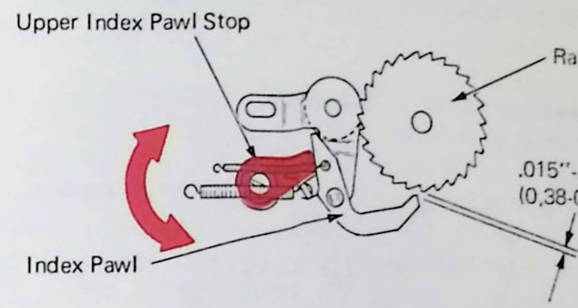
NOTE: Adjustment of the index link and index link stud must be considered together. Make these adjustments alternately until both are correct.



Adjust For 1T Motion of Platen

(Right Side View)

16. *Upper Index Pawl Stop (Level 1)* – With the inde
latched at rest, adjust the upper index pawl s
obtain .015"-.030" clearance between the index
and the platen ratchet.

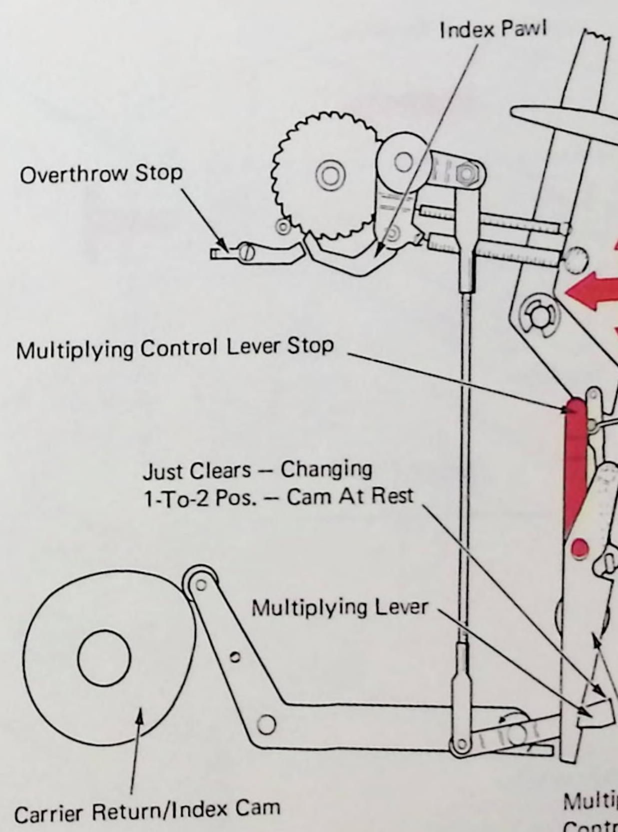


(Left Side View)

17. *Multiplying Control Lever (Level 1)* – Positio
multiplying control lever stop front to rear so the
gated hole is centered on its mounting stud. Th
preliminary adjustment and may need to be ch
slightly.

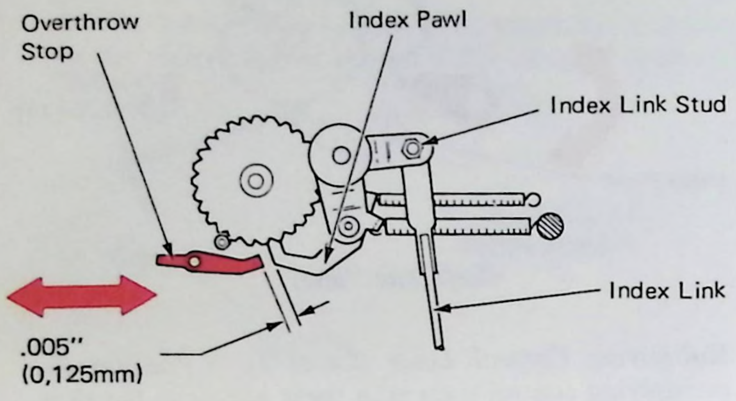
Adjust the multiplying control lever vertically t
clear the bottom edge of the multiplying lever wi
carrier return index cam at rest. Keep the high po
the eccentric toward the front of the machine.

Adjust the multiplying control lever stop front t
to obtain two full teeth of motion from the index
after it begins to drive the platen. Be sure that the
motion is not choked off with the platen over
stop.



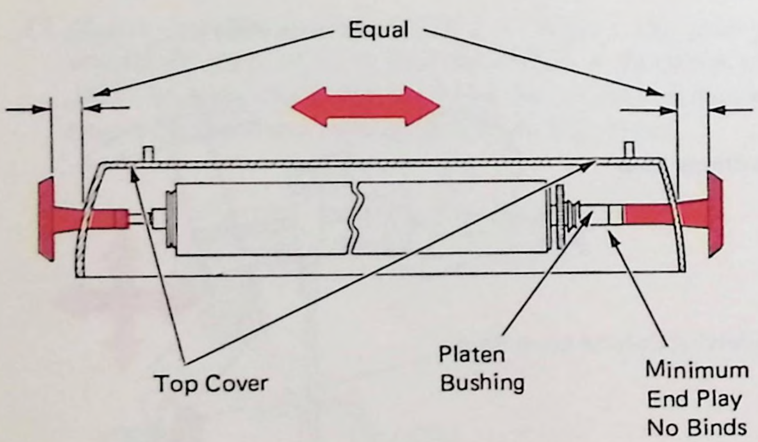
(Right Side View)

18. *Platen Overthrow Stop (Level 1)* – Adjust the platen overthrow stop front to rear to obtain a clearance of .005" between the index pawl and the platen overthrow stop with the index cam rotated to its high point.



(Right Side View)

19. *Platen Knobs* – Position the right platen knob for minimum end play of the platen bushing. The platen bushing must turn freely on the platen shaft. Position the left platen knob to match the right platen knob with top cover in place.



(Front View)

FABRIC RIBBON OPERATIONAL THEORY

The fabric ribbon mechanism can be divided into two separate mechanisms. They are the ribbon lift mechanism and the ribbon feed mechanism. The ribbon lift raises the ribbon to the printing position before the typehead prints and then restores the ribbon to allow a visible writing line. The ribbon feed moves the ribbon laterally past the printing point to provide an unused portion for the next typing operation. Included in the ribbon feed mechanism is the ribbon reversing mechanism which changes the feeding direction when either end of the ribbon is reached.

The ribbon is a 9/16" fabric ribbon enclosed in a disposable cartridge unit for clean handling. The cartridge unit contains two spools on which the ribbon is wound. The ribbon is constantly fed from one spool to the other and back again. Once the ink supply has been depleted, the cartridge is simply snapped off, discarded and a new cartridge is installed (Figure 1).

Located to the right of the pointer on the carrier assembly is the ribbon load lever. When this lever is pushed to the right, it forces the ribbon lift guide into an extreme lift position for convenience of changing the ribbon. This load lever is detented to hold the ribbon lift in the high lift position. The cartridge is then removed from the ribbon feed plate and the ribbon can be easily removed from the guide without touching the ribbon.

A new ribbon can be installed by reversing the above procedure. Tapered lugs on the sides of the ribbon feed ratchets automatically guide the ribbon spools into the correct position. Guide lugs at each side of the feed plate maintain the lateral position of the cartridge. Retainer springs attached to the guide lugs hold the cartridge down to prevent vibration. After the ribbon is installed, the load lever is moved back to the left to allow the ribbon to restore to its normal position for a typing operation.

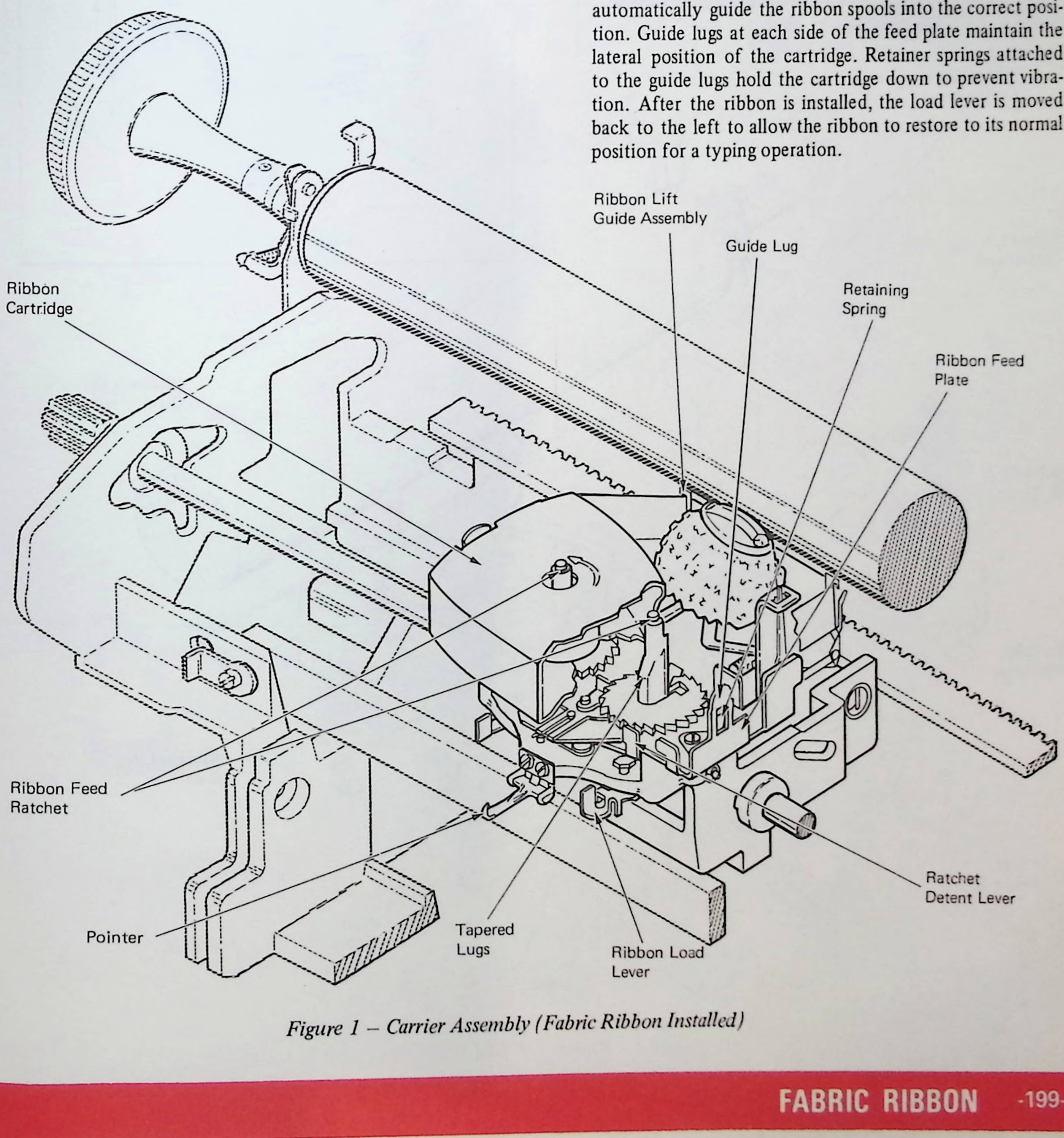


Figure 1 – Carrier Assembly (Fabric Ribbon Installed)

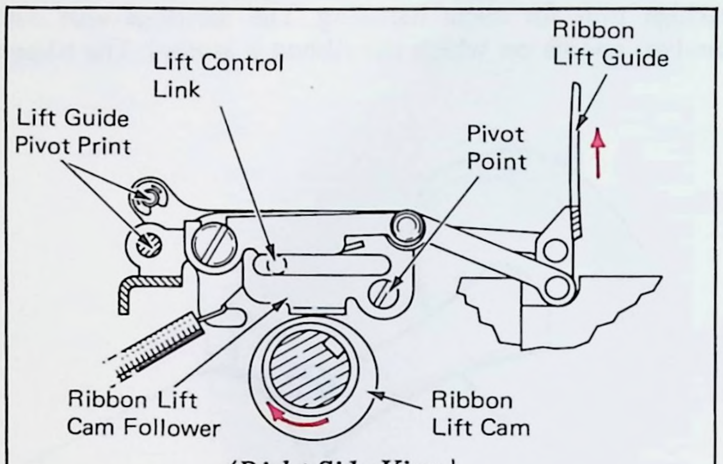
RIBBON LIFT

The ribbon lift mechanism consists of a lift cam, a ribbon lift cam follower, a control mechanism, and the ribbon lift guide assembly (Figure 2). The lift mechanism is mounted to the carrier and moves with it. The ribbon lift cam is a single lobe cam that is setscrewed to the left side of the print sleeve. Each time a print cycle occurs the cam makes one complete revolution.

The ribbon lift cam follower pivots on the carrier assembly above and to the rear of the cam. Each revolution of the cam raises the cam follower. The end of the ribbon lift control link fits into an elongated slot in the cam follower. The ribbon lift guide rests on the control link and pivots at the front of the carrier casting. As the cam follower is raised, the control link forces the ribbon lift guide assembly to pivot at the front and raise the rear of the assembly. A flat link from each side of the ribbon lift guide attaches to two pins at the front of the carrier to maintain the ribbon lift guide in a vertical position.

The fabric ribbon mechanism has four lift positions. A lift position is selected by manually positioning the ribbon lift lever for stencil, low, medium, or high lift position. The height to which the ribbon will be raised is determined by the position of the ribbon lift control link in the elongated slot of the cam follower. When the control link is to the rear of the slot, no motion is transferred to the lift guide assembly. When the control link is to the front of the slot, maximum motion is imparted to the lift guide assembly.

The ribbon lift guide assembly is spring loaded into the rest position to ensure that it will restore rapidly and to prevent overthrow of the ribbon due to the momentum of the lift mechanism.



(Right Side View)

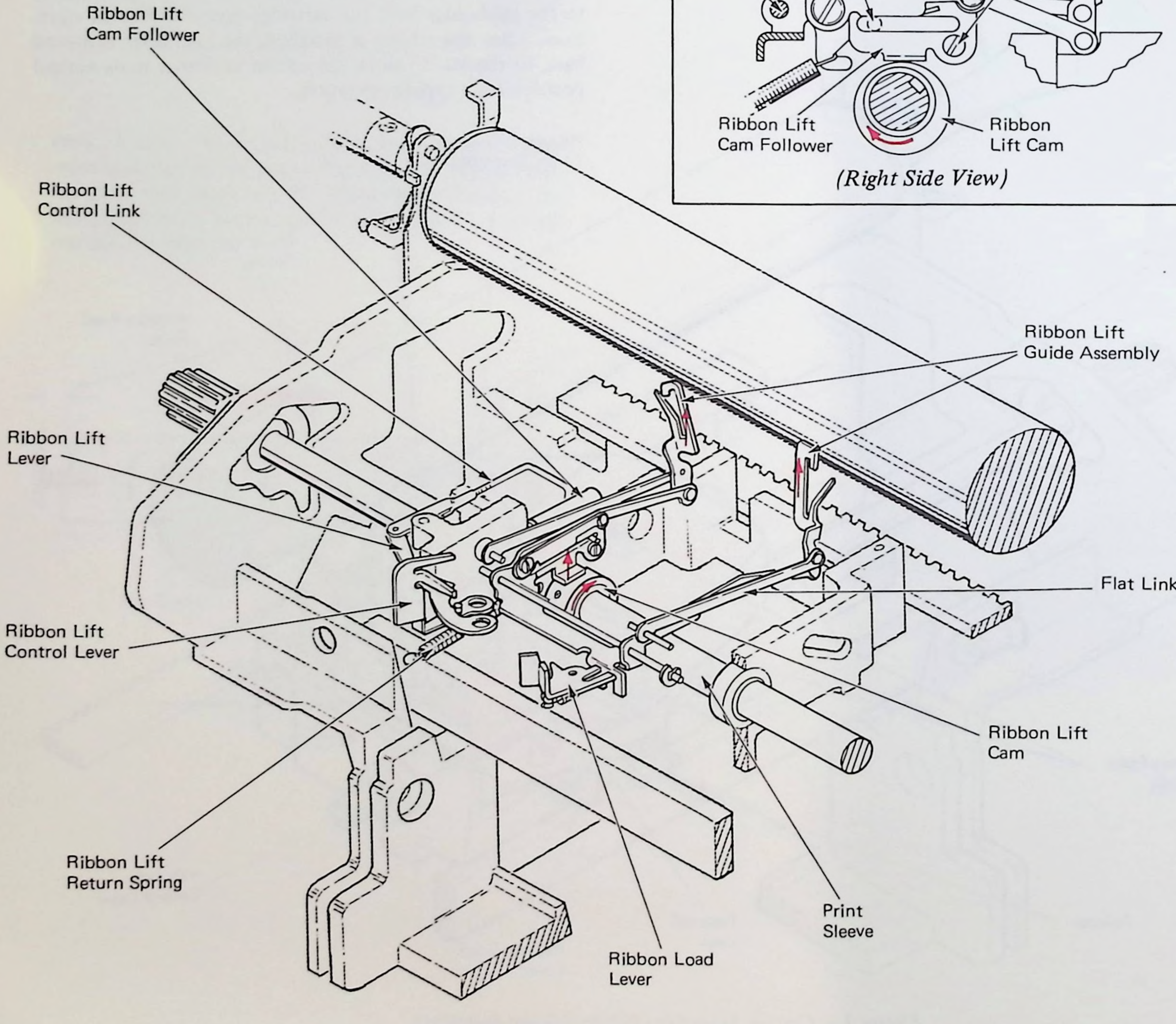


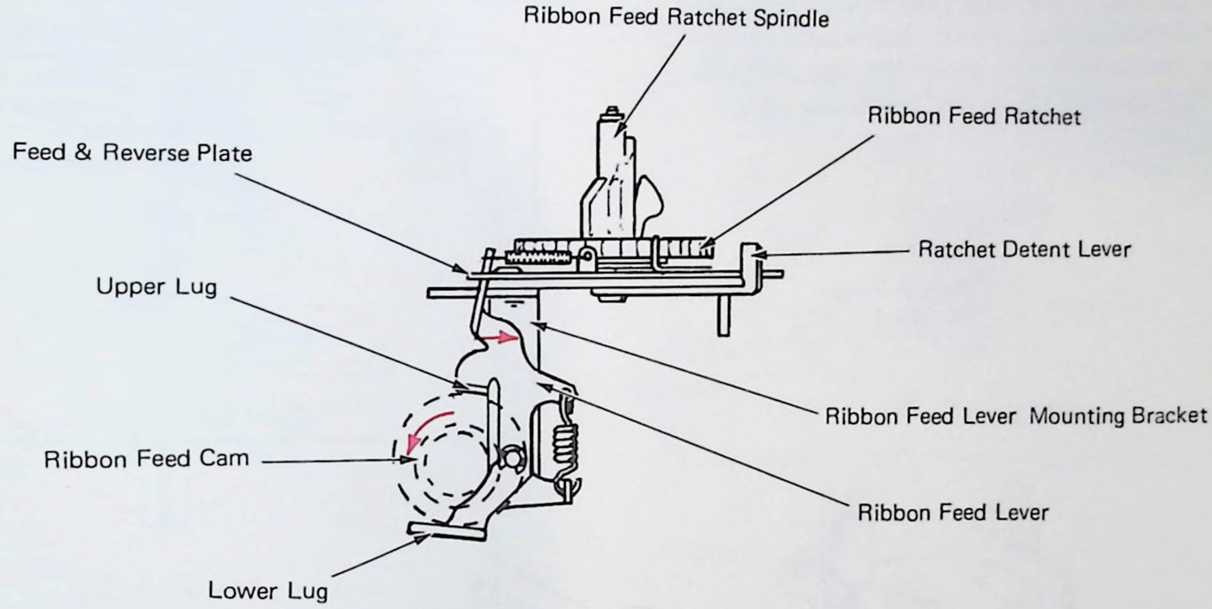
Figure 2 – Ribbon Lift Guide

RIBBON FEED OPERATION

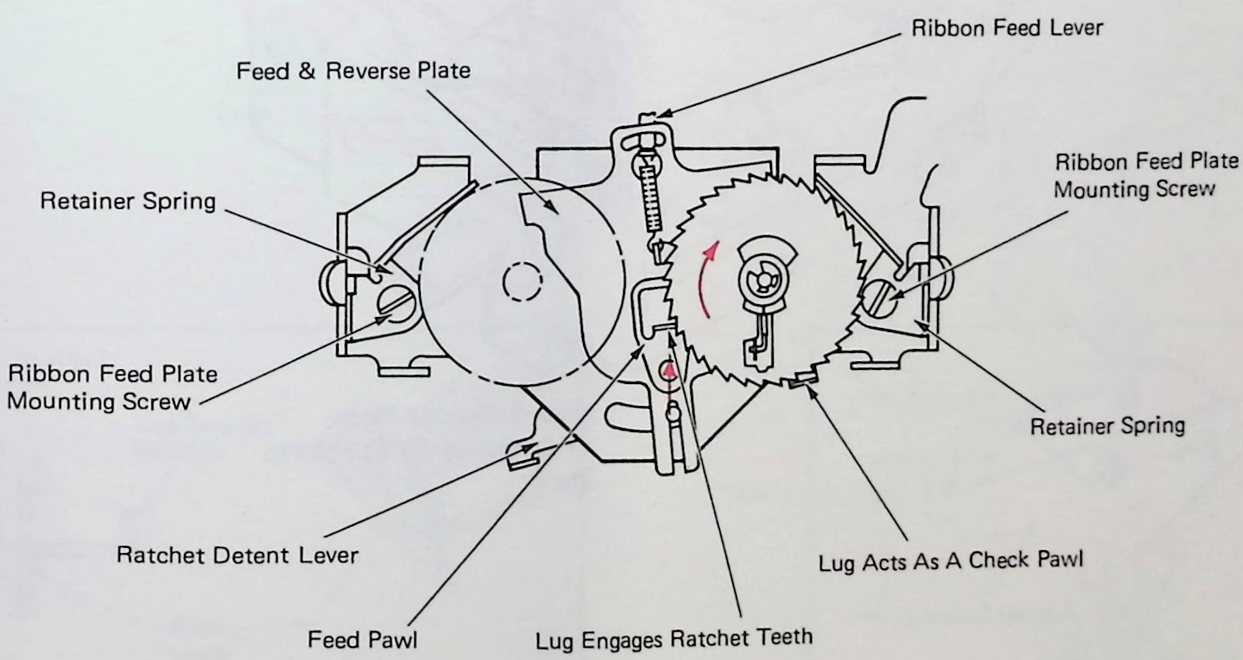
The ribbon feed and reverse mechanism is mounted at the top of the carrier just in front of the typehead. The mechanism is detachable as a unit for repair or replacement purposes (Figure 3).

The ribbon feed plate is made up of the following items: Two ribbon feed ratchets, the ribbon feed lever, the ratchet detent lever, the ribbon feed and reverse plate, and a bracket that is used to attach the ribbon feed lever. The feed and reverse plate has the ribbon feed pawl mounted to it with a shouldered stud so that it can pivot freely. The ribbon feed lever protrudes through an elongated slot in the feed and reverse plate so it can transfer the rotary motion of the feed cam to front to rear motion of the feed pawl. The front to rear motion of the feed pawl is used to move a ribbon feed ratchet two teeth to the rear on each feed stroke. The ratchet to be fed is determined by the position of the ratchet detent lever.

The ribbon feed ratchet assemblies rotate freely around their respective feed ratchet spindles. The ribbon feed ratchet is designed to center the ribbon supply hub within the ribbon cartridge and lock it in place radially so that when the ribbon feed pawl moves a ratchet, the supply spool will also move. Two flat retainer springs are mounted on the ribbon feed plate at the rear so that they rest against the ribbon feed ratchets. The slight drag applied by the springs prevents the jerk of the ribbon feed operation from spinning the supply spool and spilling off excessive ribbon.



(Left Side View)



(Top View)

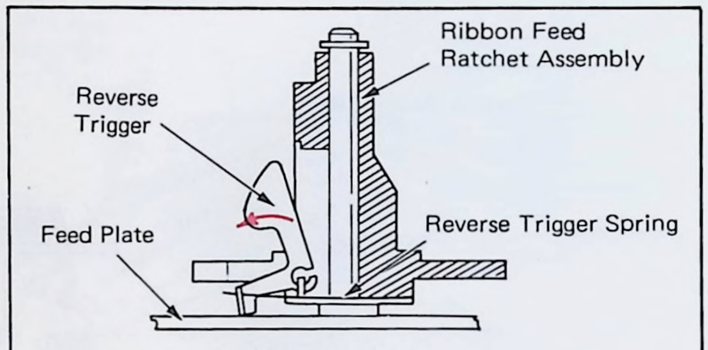
Figure 3 – Ribbon Feed Operation

RIBBON REVERSE OPERATION

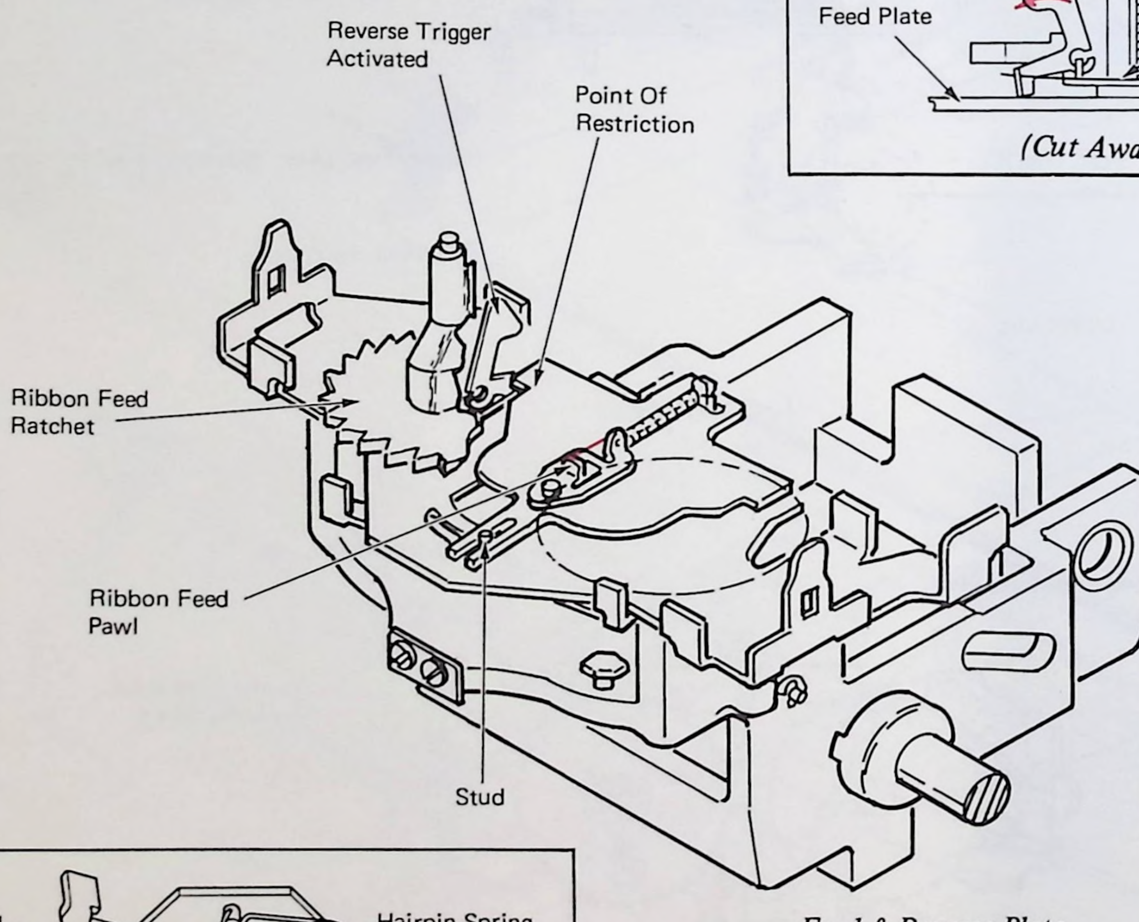
Each feed ratchet contains a small bellcrank called the ribbon reverse trigger (Figure 4). This trigger is spring loaded down by a small flat reverse trigger spring. The reverse trigger is held within the ribbon feed ratchet in the inactive position as long as ribbon is around the spool. During the last revolution of the supply spool, the reverse trigger is released into the active position. This causes the lower extension of the reverse trigger to drop into the path of a notch in the feed and reverse plate.

On the forward or restoring stroke of the plate, the reverse trigger restricts one side of the plate from sliding forward. The other side continues to slide forward, thereby causing a pivoting action to the entire plate about the point of restriction. This makes the front of the plate pivot toward the opposite side, positioning the feed pawl in line with the ratchet teeth of the ribbon feed ratchet containing the empty ribbon spool. On the next feed stroke, the feed pawl will engage the ratchet teeth of the empty spool, causing it to begin to take on ribbon.

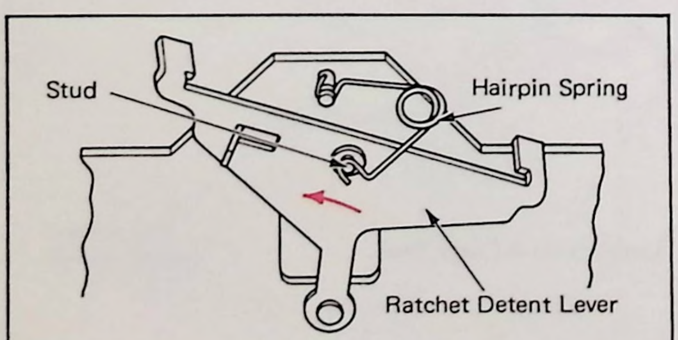
Since the reversing action makes the "full" take-up spool become the supply spool and the "empty" supply spool become the take-up spool, it is necessary to disengage the ratchet detent lever from one feed ratchet and engage it with the other. This is done in step with the reversing operation (Figure 4). As the front of the feed and reverse plate swings, causing the feed pawl to engage with the opposite feed ratchet, it pivots the ratchet detent lever to the opposite spool. A stud riveted to the lever protrudes up through a slot in the feed and reversing plate linking the two together. A hairpin spring, fastened to this stud and anchored to the feed plate, provides a toggling action to both the feed and reverse plate and the ratchet detent lever. In addition, the hairpin spring keeps the ratchet detent lever constantly spring loaded against the teeth of the feeding ratchet.



(Cut Away Viw



Feed & Reverse Plate At Beginning Of Restoring Stroke



(Bottom View)

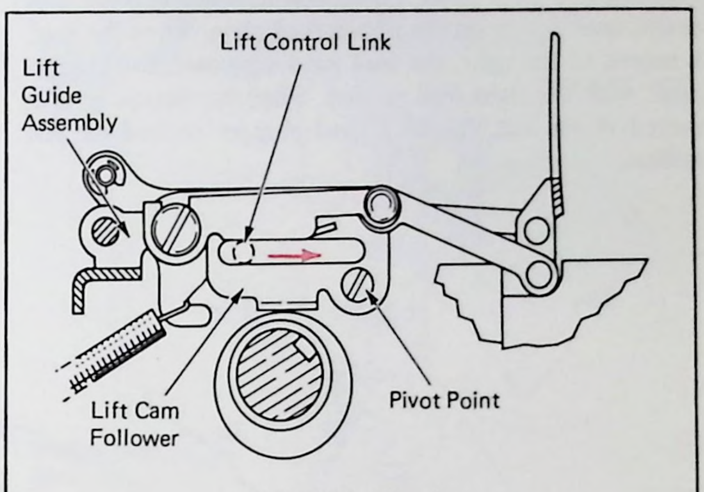
Figure 4 – Ribbon Reverse Operation

STENCIL LOCKOUT

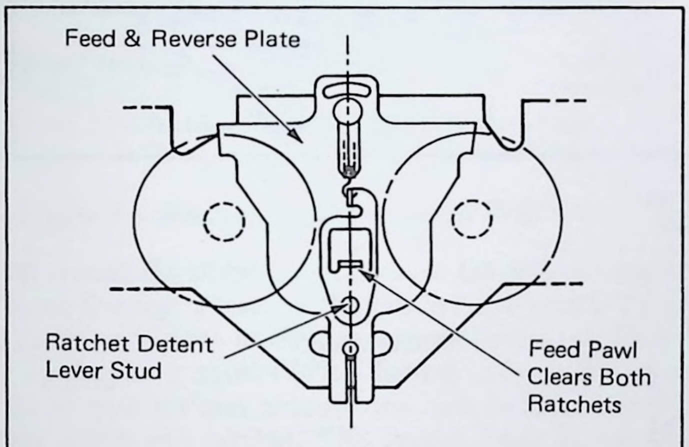
Ribbon feed is interrupted during the stencil mode of operation. This is accomplished by centering the feed pawl between the ratchet spools so it can move freely front to rear without engaging a ratchet tooth. The feed pawl is caused to operate in this manner by the ribbon lift lever when it is in the no lift or stencil position (Figure 5).

Two lugs on the ribbon lift lever form a "V" which traps a lug on the ratchet detent lever. As the ribbon lift lever is placed in the stencil position, one or the other of the lugs, depending upon which spool is being driven, will contact the lug on the ratchet detent lever and cam it to the center of the "V". At this point, the ribbon lift lever will be in a detented position and the ratchet detent lever will be centered. With the ratchet detent lever in this position, the feed pawl will be guided between the ratchet spools.

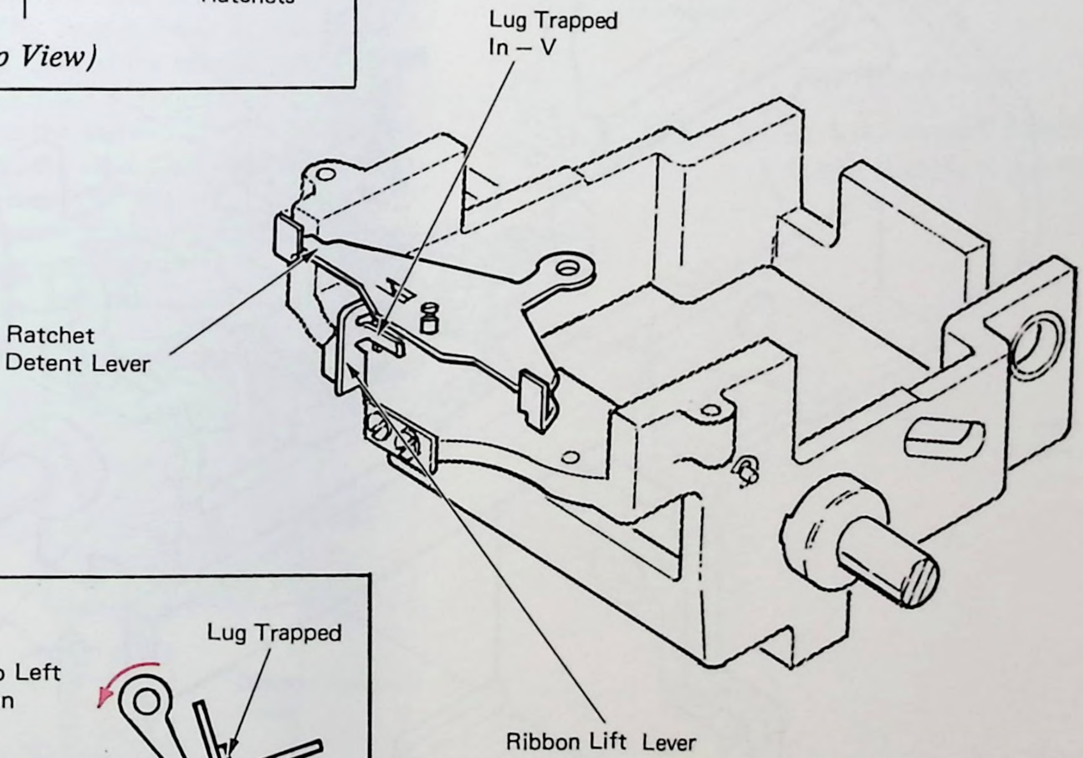
Ribbon lift is also interrupted during the stencil mode of operation. When the ribbon lift lever is in the stencil position, the ribbon lift control link is allowed to move to the rear of the elongated slot in the lift cam follower (Figure 5). This places the end of the lift control link directly above the lift cam follower pivot point. As the lift cam rotates, the end of the lift control link simply rotates around the cam follower pivot point and no motion is transferred to the lift guide assembly. This prevents the ribbon from lifting into the path of the typehead during a stencil operation.

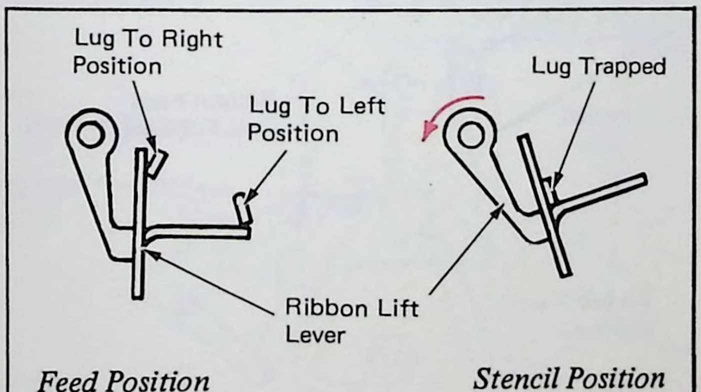


(Right Side View)



(Top View)





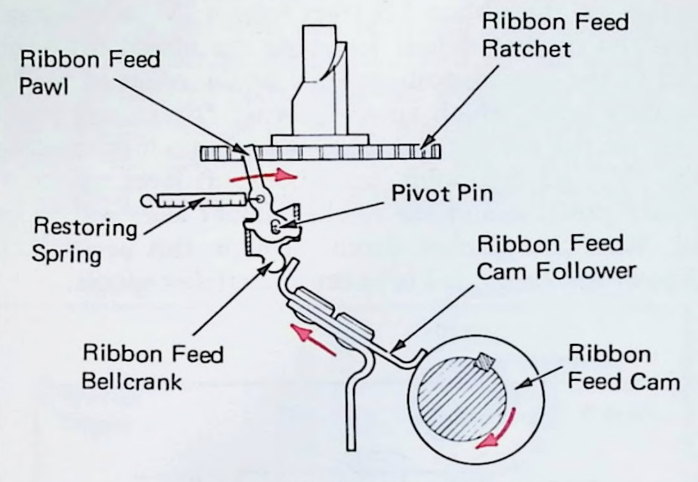
(Top View)

Figure 5 – Stencil Lockout

LEVEL 1 FEED

The old-level ribbon mechanism contains a few more parts than the current mechanism, however, the operation is similar. The position of the feed pawl determines which ratchet is fed as the pawl moves to the rear. The feed pawl pivots on a pin beneath the ribbon feed plate and extends up through a hole in the plate (Figure 6). Mounting of the pawl permits left to right as well as front to rear movement. An extension spring attached to the pawl restores the pawl to the rest position each time it operates. The spring also holds the pawl left or right into engagement with the correct ribbon feed ratchet depending upon the direction of the pull of the spring. The forward end of the spring is attached to a lever called the ribbon feed detent lever. The detent lever pivots on the ribbon feed plate. When the lever is moved to the right, the feed pawl is pivoted into engagement with the right feed ratchet. When the detent lever is moved to the left, the feed pawl engages to feed the left ratchet.

The ribbon feed pawl is powered to the rear by the action of the ribbon feed cam. A sliding cam follower transfers the motion of the cam to the ribbon feed bellcrank which pivots and actuates the feed pawl to the rear. Sufficient motion is available from the cam to cause two teeth to feed on the ratchet.



(Right Side View)

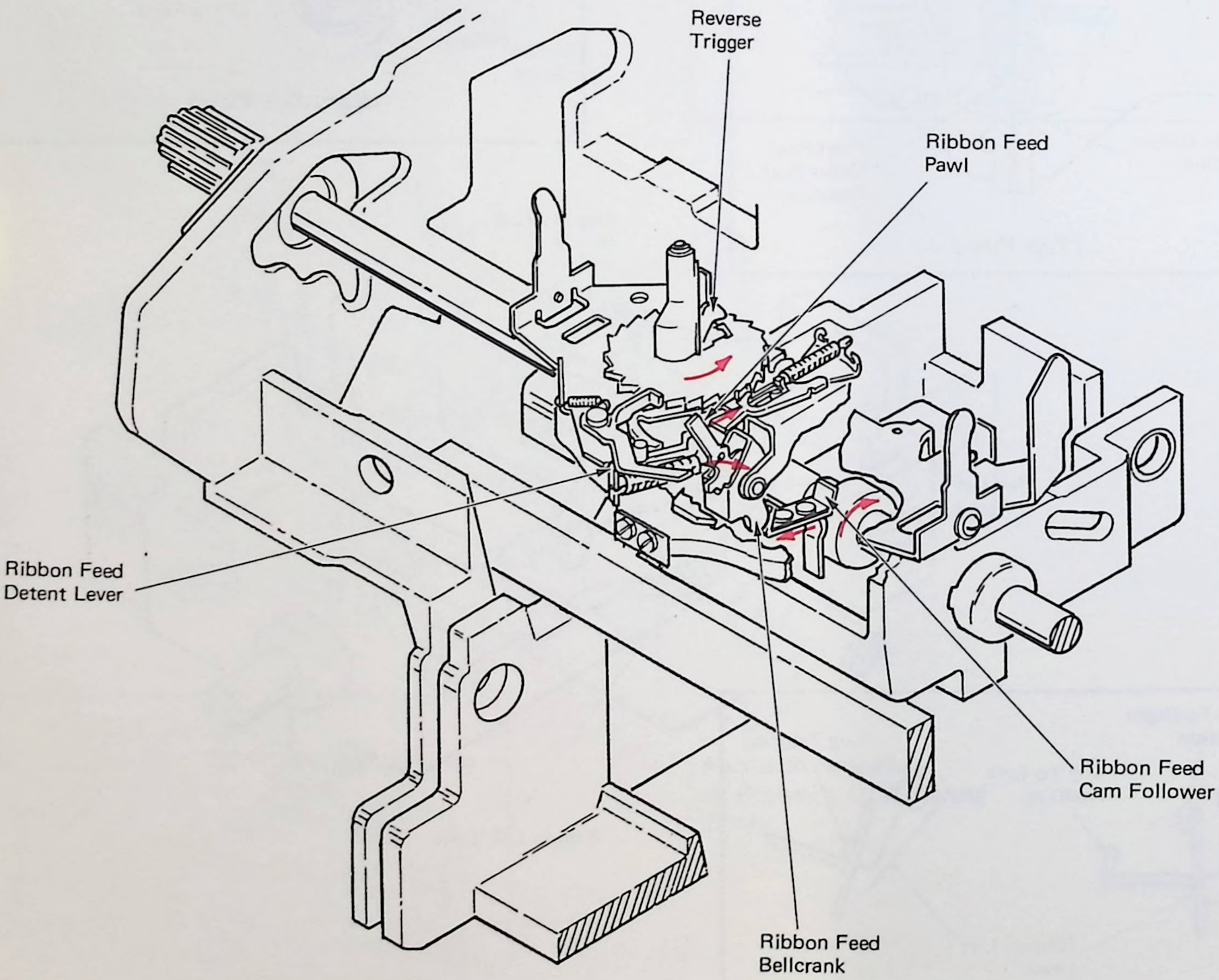


Figure 6 – Ribbon Feed Mechanism (Level 1)

As the feed pawl restores to the front, it slides along the teeth of the ratchet into the rest position (Figure 7). The drag of the pawl along the teeth tends to rotate the ratchet backwards and unwind the ribbon. To prevent any backward rotation, a detent pawl is spring loaded into the teeth of the ratchet to allow feed in one direction only.

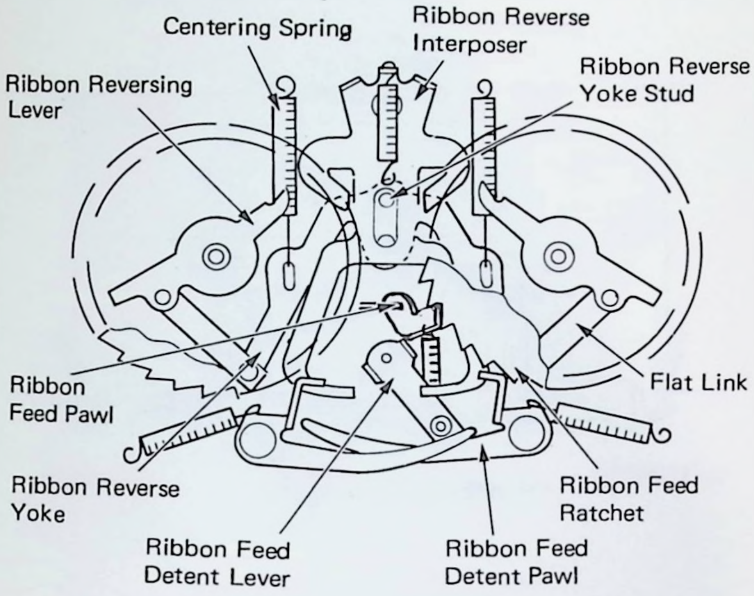


Figure 7 – Ribbon Feed Pawl (Rest Position – Top View)

To reverse the ribbon, a portion of the reverse trigger pivots down through a hole in the ratchet into position below the ratchet as it does in the current mechanism (Figure 8). The empty spool rotates slightly farther causing the reverse trigger to contact and actuate the reverse lever which pivots just below the ratchet. The reverse lever is connected by means of a flat link, to an arm of the reverse yoke beneath the ribbon feed plate. The yoke is pivoted by operation of the reverse lever. A stud on the yoke at the rear of the pivot point extends up through the feed plate into a slot in the reverse interposer. Movement of the yoke positions the front of the reverse interposer left or right depending upon which ribbon spool is being emptied.

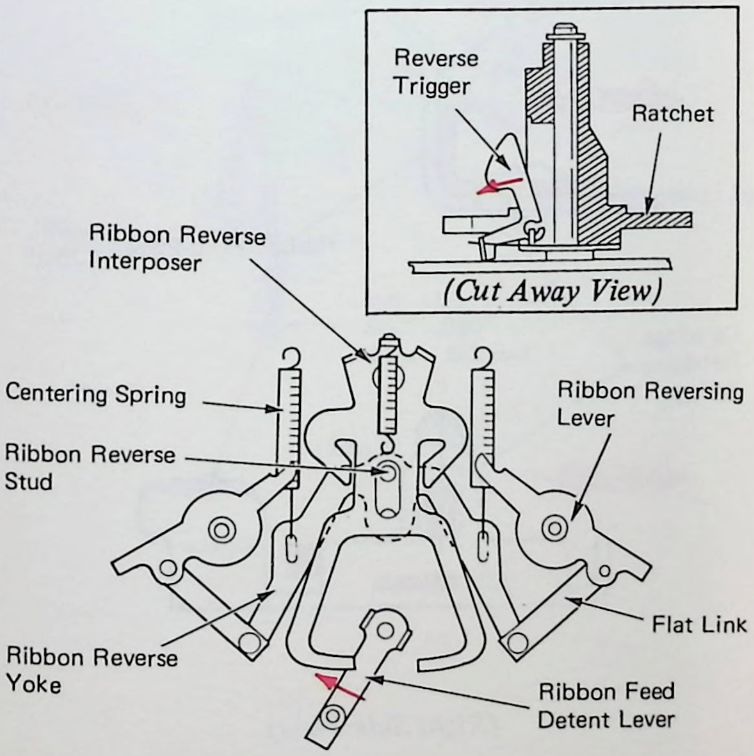


Figure 8 – Ribbon Reverse Mechanism (Top View)

Two things occur when the reverse interposer is positioned. A hook at the front of the interposer hooks around a lug on the ribbon feed detent lever (Figure 9). The interposer lever, mounted on the interposer, is positioned into the path of the ribbon feed pawl. The next operation of the ribbon feed cam causes the feed pawl to drive the reverse interposer to the rear. The hook at the front of the interposer pulls the lug of the detent lever to the rear causing the detent lever to pivot to the opposite position.

As the feed pawl restores, its spring pivots it over into engagement with the opposite ratchet.

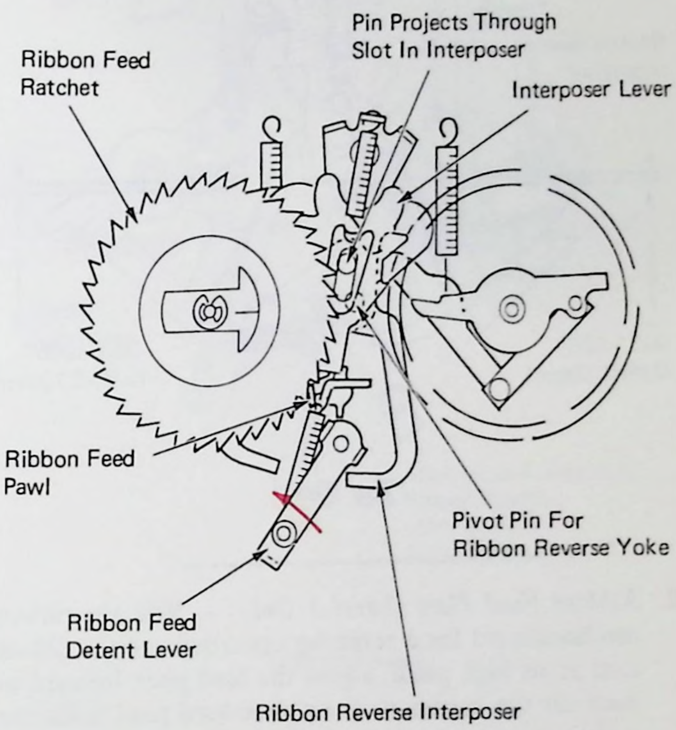
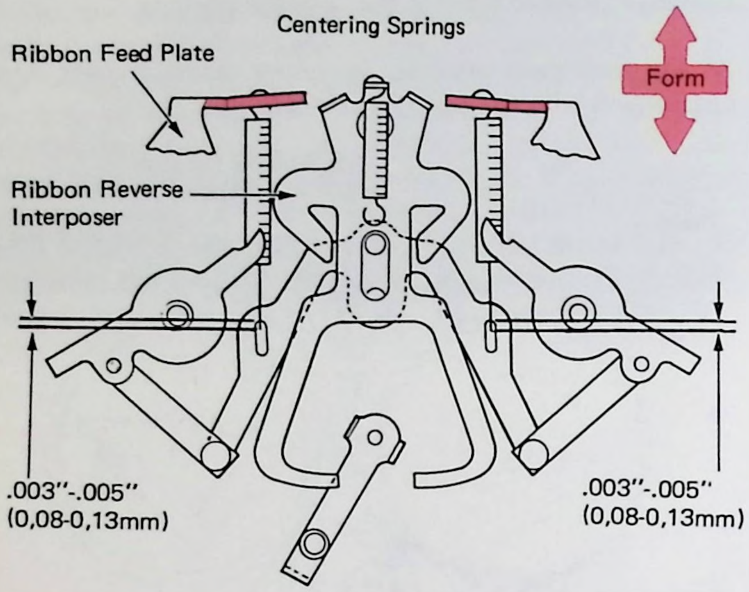


Figure 9 – Ribbon Reverse Mechanism (Active Position – Top View)

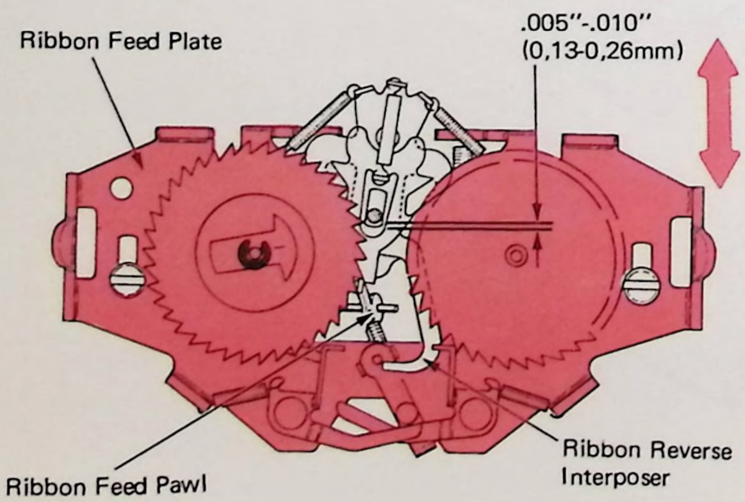
1. *Centering Spring (Level 1 Only)* – With the ribbon reverse interposer centered, form the lugs of the ribbon feed plate for .003"-.005" clearance in the centering spring loops. This adjustment ensures that the springs are not extended when at rest and that they will properly restore the mechanism after a reverse operation.



(Top View)

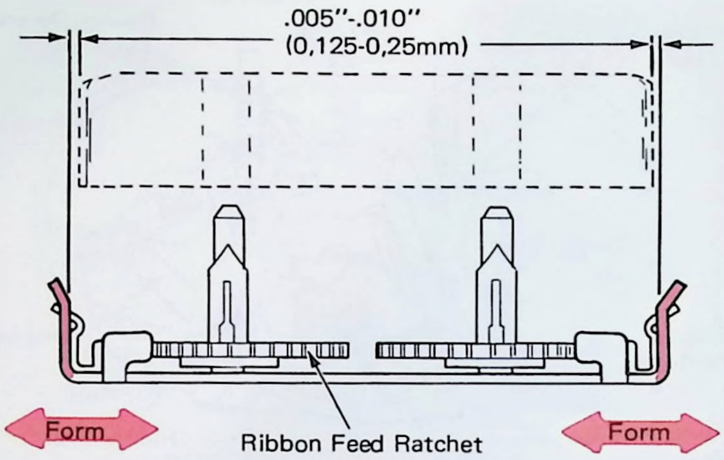
2. *Ribbon Feed Plate (Level 1 Only)* – With the ribbon mechanism set for a reversing operation and the ribbon cam at its high point, adjust the feed plate forward or back on the carrier so the ribbon feed pawl holds the reverse interposer within .005"-.010" of its total travel. This adjustment not only ensures sufficient throw for a reversing operation, but also gives optimum ribbon feed results by determining the rest and active positions for the pawl.

CAUTION: After completing the adjustment, manually cycle a character to see that two teeth feed is obtained plus .005"-.010" overthrow. Be sure that the feed pawl does not contact the interposer lever as the pawl is manually reversed from side to side.



(Top View)

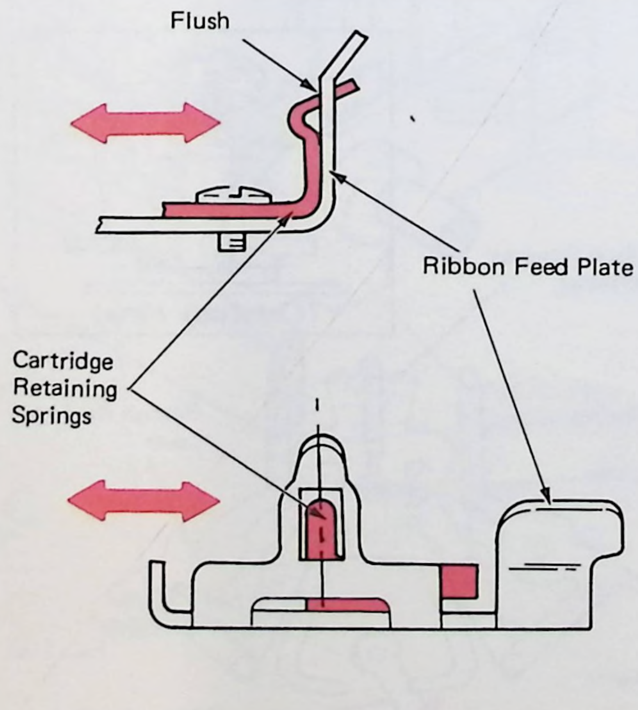
3. *Cartridge Guide Lugs* – Form the cartridge guide lugs so the cartridge spools will be centered over the ratchets. Side play of the cartridge must be limited within .005"-.010".



(Front View)

4. *Cartridge Retaining Springs (Level 2 Only)* – The cartridge retaining springs should be positioned laterally so they are FLUSH against the feed plate; then adjust front to rear so the cartridge retaining fingers are centered in the holes of the cartridge guide lugs. The ratchet brake portion of the spring should exert a small drag on the feed ratchet. Form only as necessary.

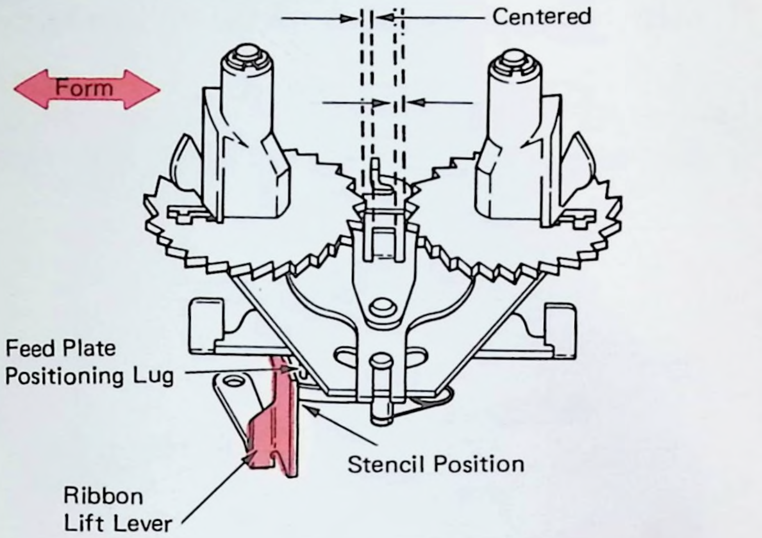
NOTE: Excessive or insufficient tension could result in reverse failure.



(Right Side View)

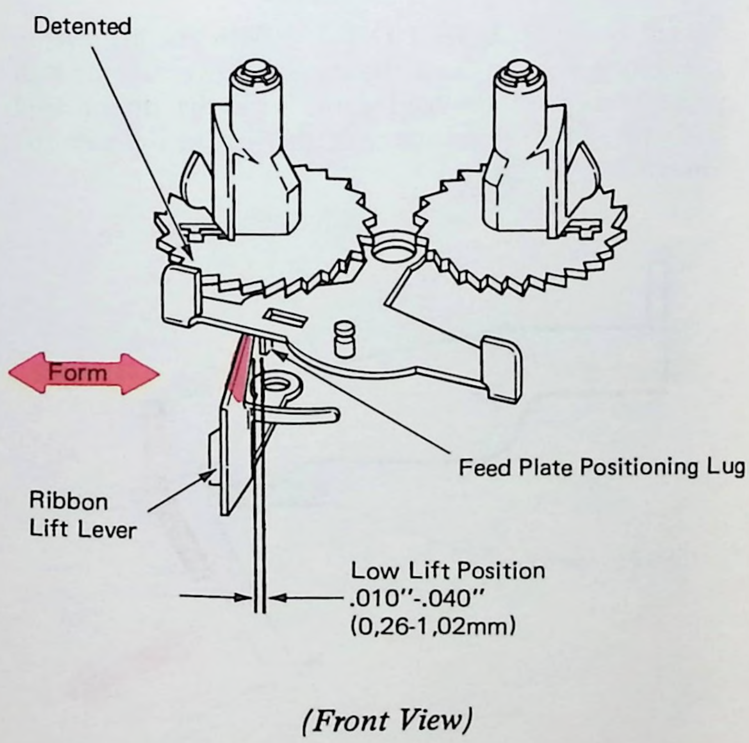
5. *Ribbon Lift Lever (Level 2 Only)* – Three conditions must be met as follows:

   a. Form the lift lever finger tab left or right so the ribbon feed pawl will center between the two feed ratchets when the lift lever is placed in stencil position.



(Front View)

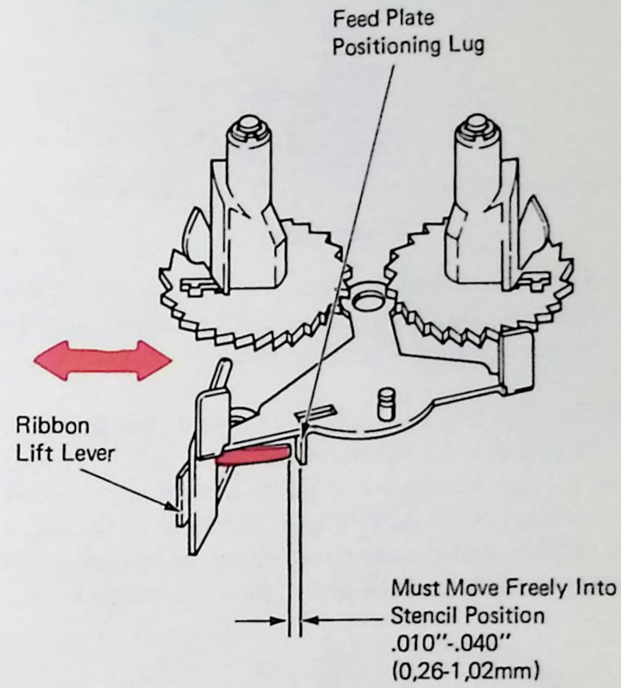
   b. Form the rear lug so a clearance of .010"-.040" exists between the lug and the feed plate positioning lug when the LEFT RATCHET IS FEEDING.



(Front View)

   c. Form the front lug so a clearance of .010"-.040" exists between the lug and the feed plate positioning lug when the RIGHT RATCHET IS FEEDING.

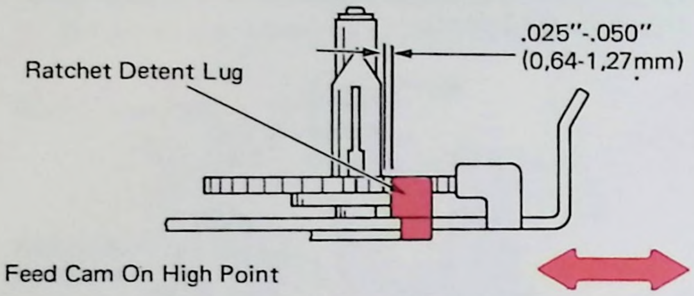
NOTE: Avoid forming the ribbon feed plate positioning lug, since breakage would require replacement of the entire feed plate.



(Front View)

6. *Ratchet Detent Lever Lugs* – These should be formed as follows:

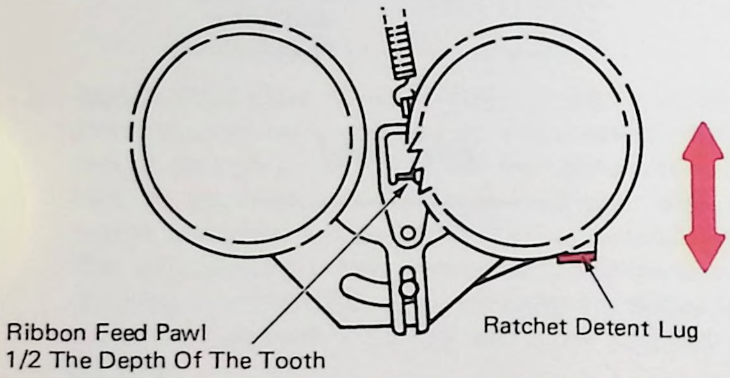
a. Left or right so the ribbon feed ratchet tooth overthrows the edge of the detented lug by .025"-.050" when hand cycling to the high point of the ribbon feed cam.



(Front View)

b. Form the detent lugs front to rear so the ribbon feed pawl engages a ratchet tooth by approximately ½ the depth of the ratchet tooth.

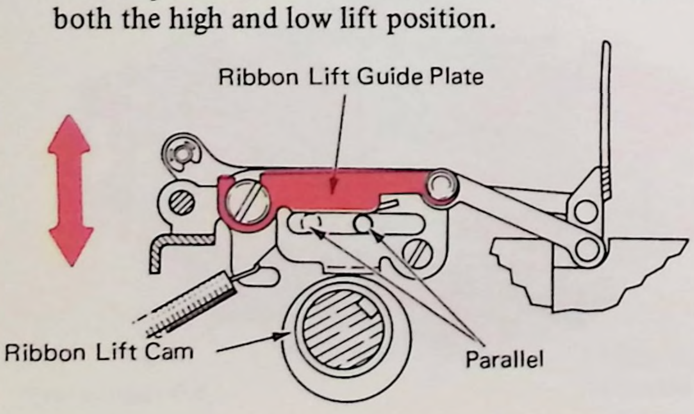
NOTE: The feed pawl spring lug should clear the teeth of the opposite ratchet by at least .015" when the feed pawl is being withdrawn to the rest position at the end of an operation. Failure to clear the teeth of the opposite ratchet under power may result in a lockup and consequent failure of the ribbon feed operation.



---

7. *Ribbon Lift Guide Plate* – Adjust the plate as low as possible without causing a change in the ribbon lift guide height as the ribbon lift lever is moved from the low lift to the high lift position. The ribbon lift cam should be at the low point when the check is made.

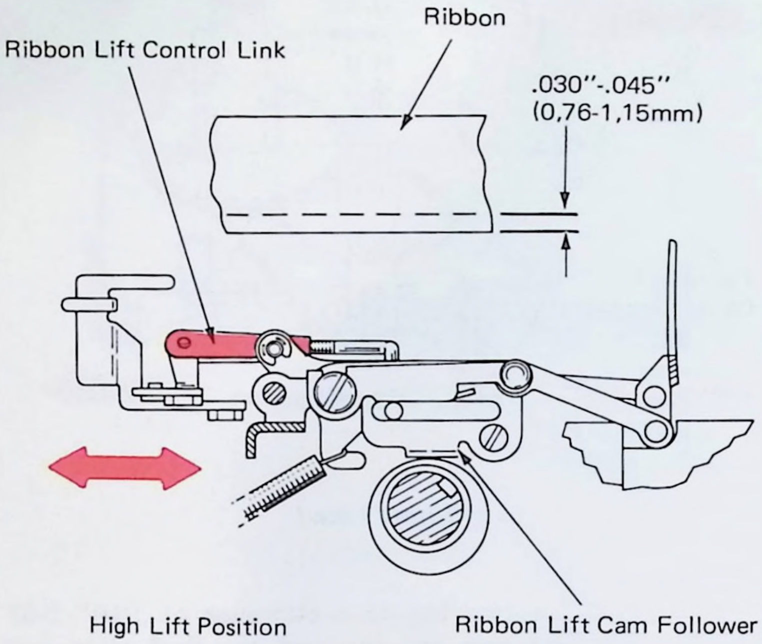
This adjustment ensures the same relative throw for both the high and low lift position.



---

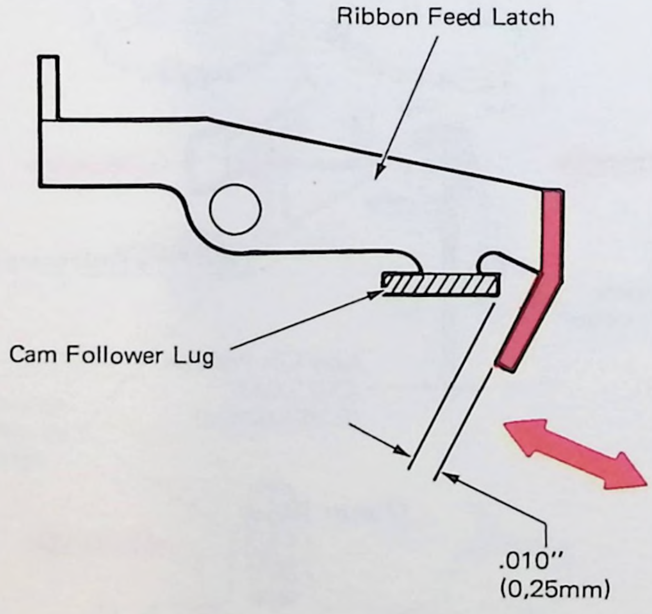
8. *Ribbon Lift Control Link* – Adjust the link forward or back by means of its clevis so the underscore will strike the ribbon .030"-.045" from the bottom edge. The ribbon lift lever must be in the high lift position when this check is made.

CAUTION: Do not adjust the link so short that it chokes off the front end of the cam follower slot as the ribbon lift lever is moved into the high lift position.



---

9. *Stencil Lockout (Level 1 Only)* – With the lift lever in the stencil position and the cam follower on the high point of the ribbon feed cam, form the ribbon feed latch for .010" clearance with the lug on the cam follower.



MARGIN CONTROL OPERATIONAL THEORY

The purpose of the margin mechanism is to allow the operator to vary the length of the writing line. This is accomplished through two margin stops and the margin rack (Figure 1). The left and right margins are determined by the position of the margin stops on the margin rack. The left margin stop is used to limit carrier travel to the left.

The right margin stop first operates a warning bell which alerts the operator when the carrier approaches the right margin, then locks the keyboard to prevent further typing.

Depression of the margin release keylever allows typing beyond the left and right margins by rotating the rack. This disengages either margin stop from the line lock bracket on the carrier.

The zone contacts and the last column contacts are used to indicate the right hand margin to an electronic device.

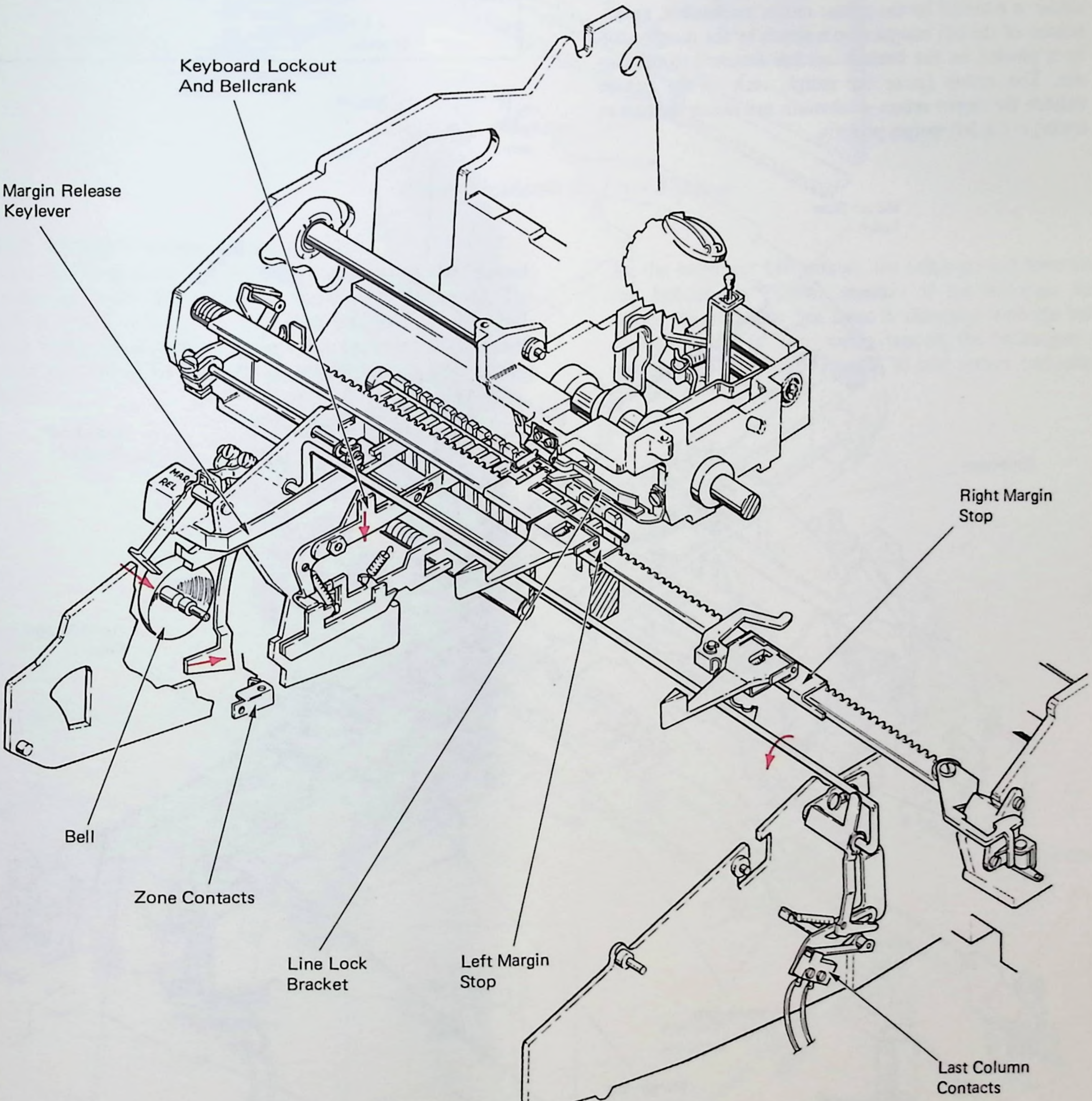
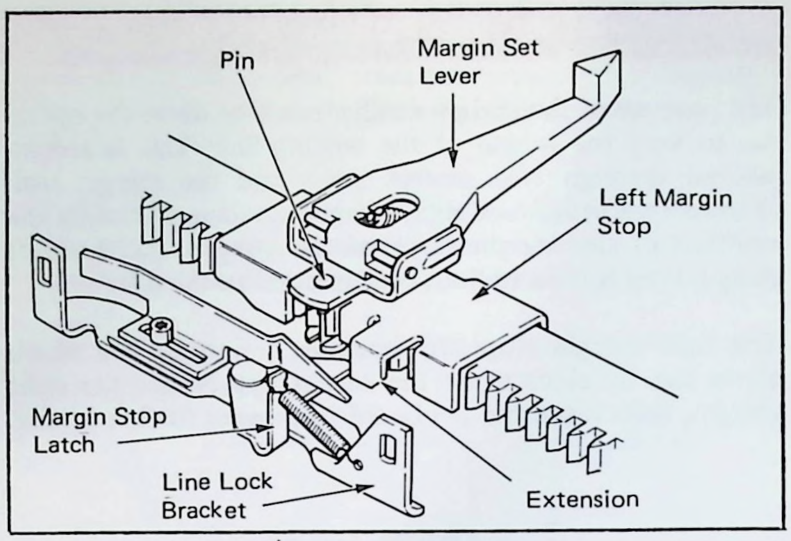


Figure 1 – Margin And Linelock

The margin rack is a flat rack containing teeth along its rear edge. The number of teeth per inch in the margin rack corresponds to the pitch of the machine (Figure 2).

Each margin stop has a pin and slider assembly that meshes with the teeth at the rear of the margin rack. Both margin stops have a margin set lever attached to the pin and slider assembly. Either margin stop may be repositioned by pushing the margin set lever to the rear to disengage the pin from the rack, and sliding the margin stop along the rack to the desired location.

The left margin stop controls the left margin. When the carrier is returned by the carrier return mechanism, an extension of the left margin stop is struck by the margin stop latch pivoted on the linelock bracket attached to the carrier. This action forces the margin rack to the left to unlatch the carrier return mechanism and leaves the carrier resting at the left margin position.



(Rear View)

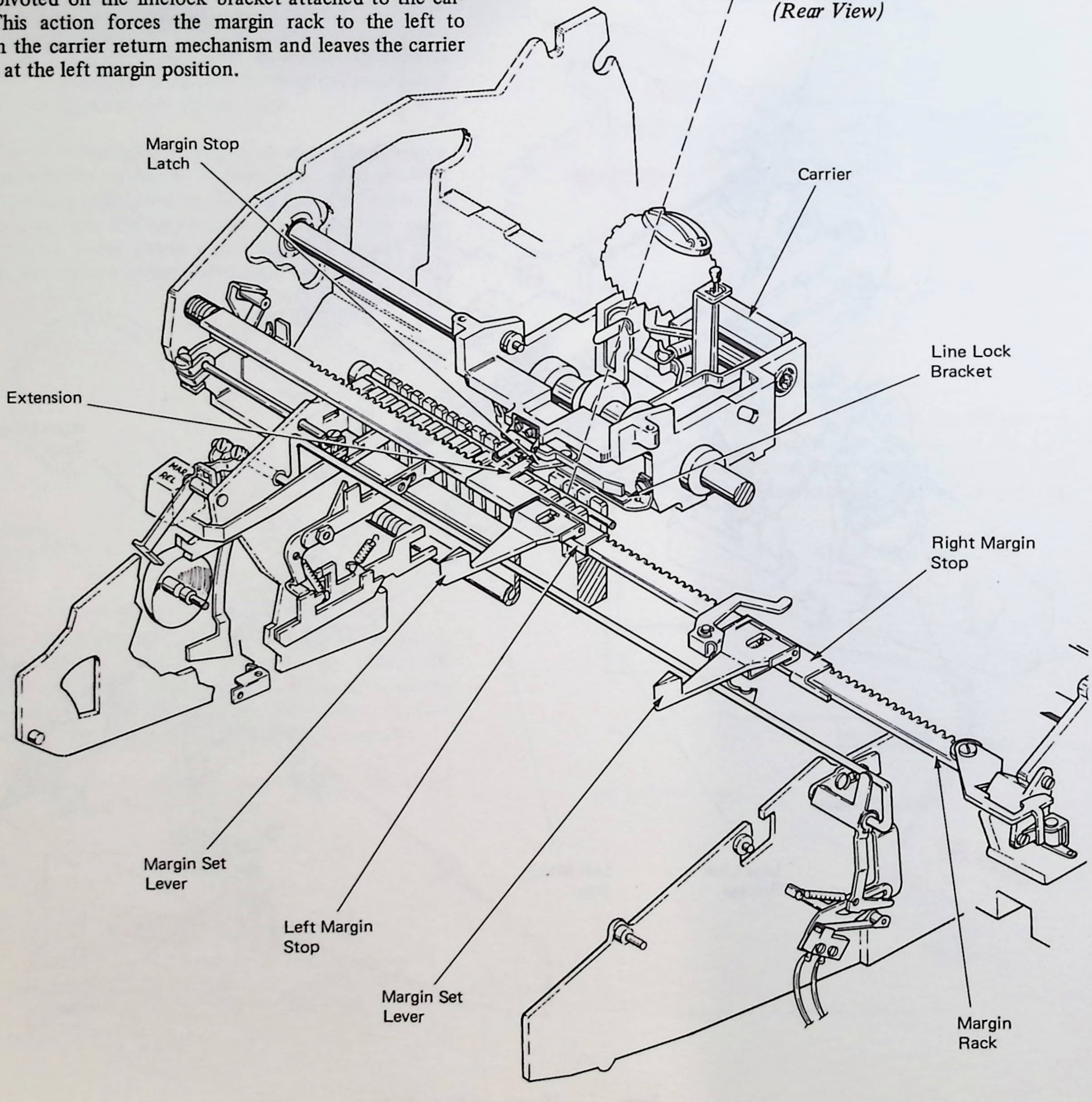


Figure 2 – Left Margin Mechanism

The margin set lever extends through a slot under the top cover scale. The indicator mark on each margin set lever serves as a pointer to indicate the position of the margin stop in relation to the scale (Figure 3). A pointer located on the front of the carrier indicates the position of the carrier.

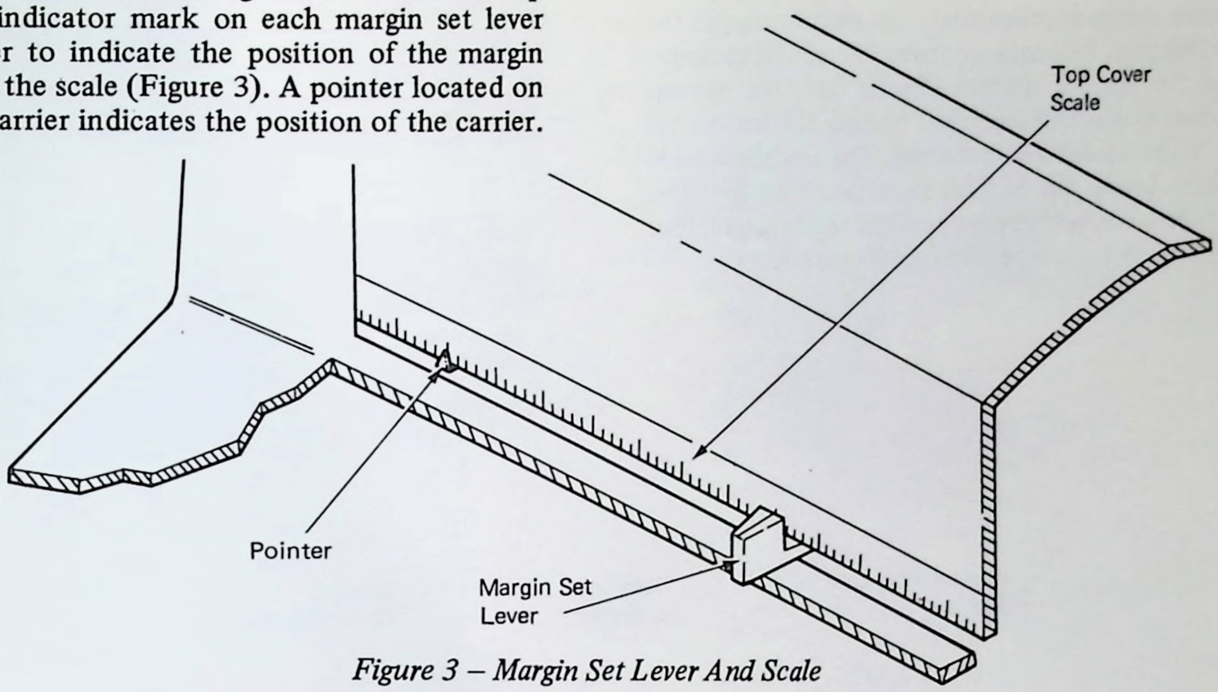


Figure 3 – Margin Set Lever And Scale

BELL RINGER MECHANISM

As the carrier approaches the right margin stop, the linelock bracket contacts the bellringer bellcrank (Figure 4). The linelock bracket has two camming surfaces. As the bellringer bellcrank moves onto the first camming surface, sufficient motion is transferred to the bellringer bail to ring the bell.

As the bellringer bail rotates, the bellringer bail lever lifts the bellclapper. Further rotation of the bellringer bail causes the bellringer bail lever to disengage with the bellclapper. Under its own spring tension, the bellclapper is restored, with sufficient velocity to over restore and strike the bell.

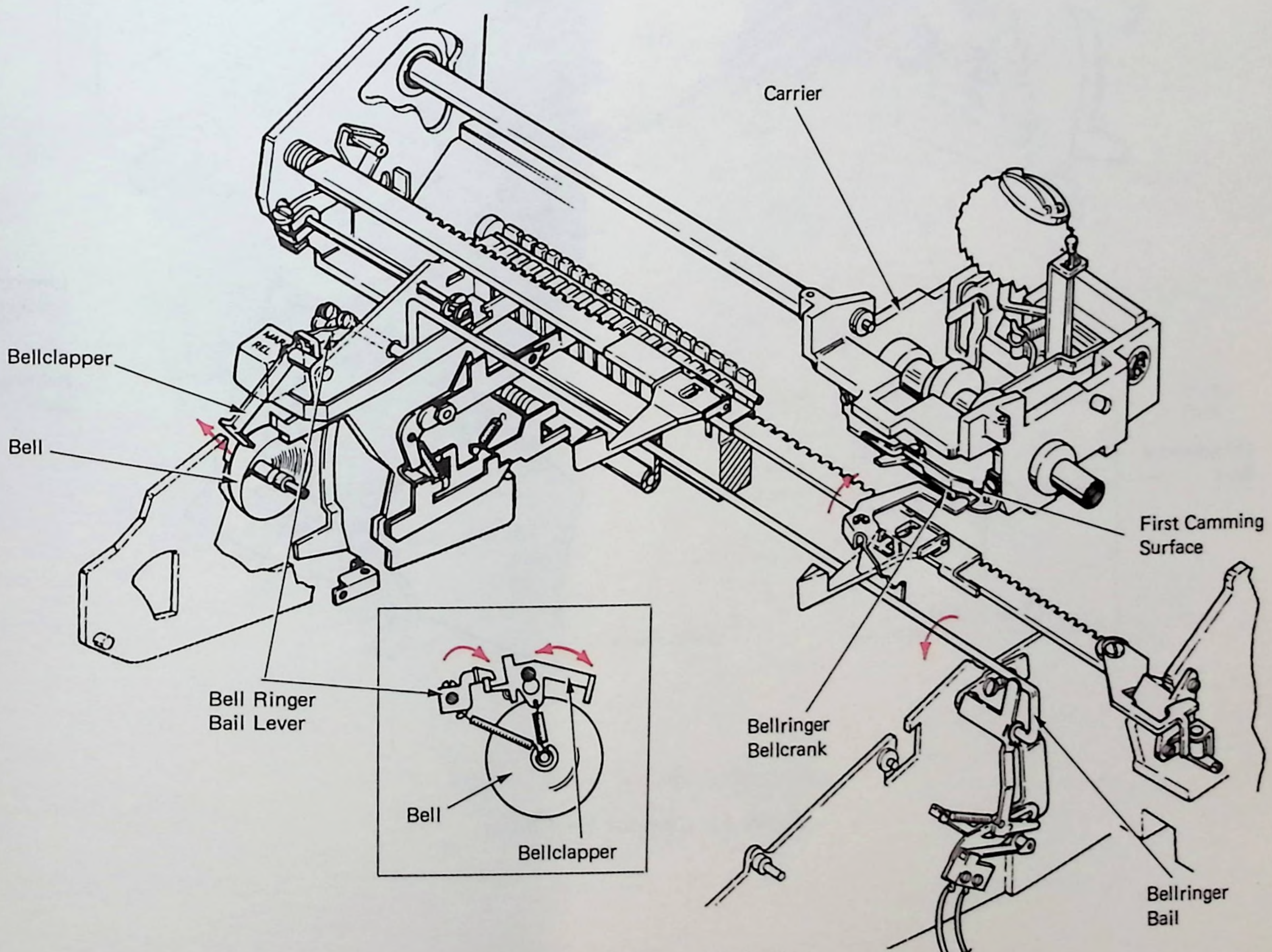


Figure 4 – Bellringer Mechanism

LINELOCK

As the carrier moves approximately one-inch further to the right, the bellringer bellcrank contacts the second camming surface of the linelock bracket (Figure 5). This delivers more motion to the bellringer bail causing the bail to operate the keyboard lockout bellcrank. The keyboard lockout bellcrank lowers the lockout interposer into the compensator tube to prevent typing past the right margin. (See Keyboard Section for compensator tube operation.)

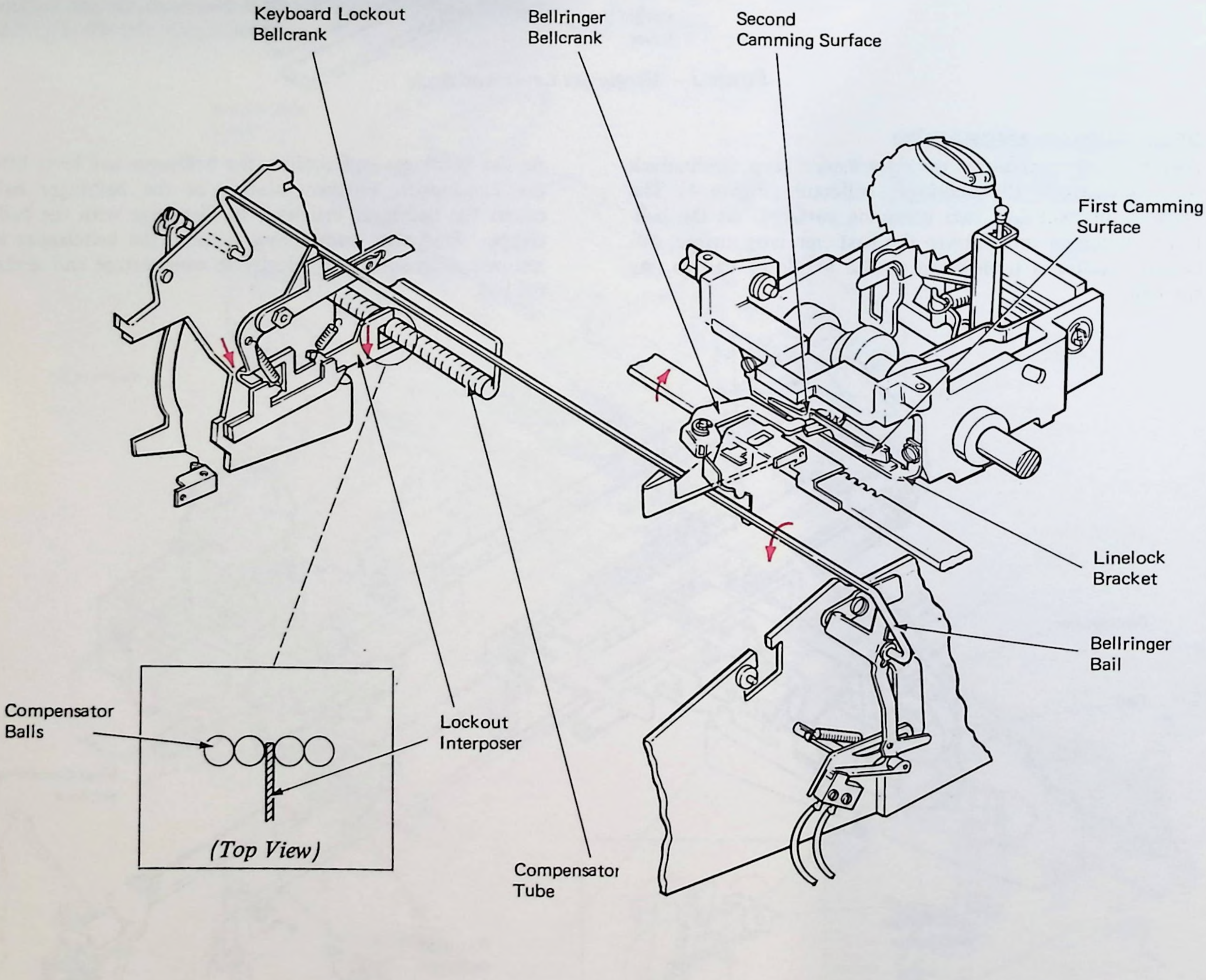
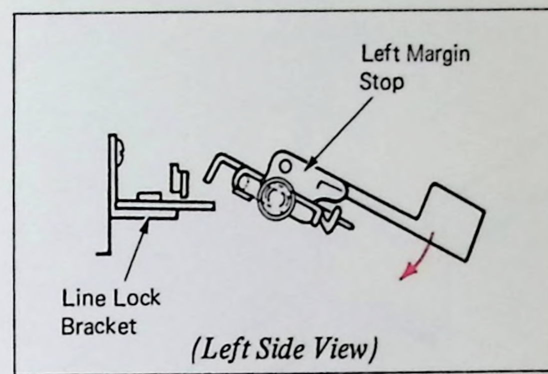


Figure 5 – Linelock Mechanism

MARGIN RELEASE

The margin release mechanism allows an operator to type beyond the left and right margins without changing the position of the margin stops. The margin release operates by rotating the margin rack so the margin stops move upward out of the path of the margin stop latch on the line-lock bracket (Figure 6).

The margin release keylever pivots at the left side of the keyboard. Depression of the margin release keylever causes the rear of the margin rack to rise. A lug on the left end of the margin rack remains in the path of the margin stop latch to unlatch the carrier return if it is operated with the margin release keylever depressed. An extension spring restores the mechanism and holds it in the rest position.



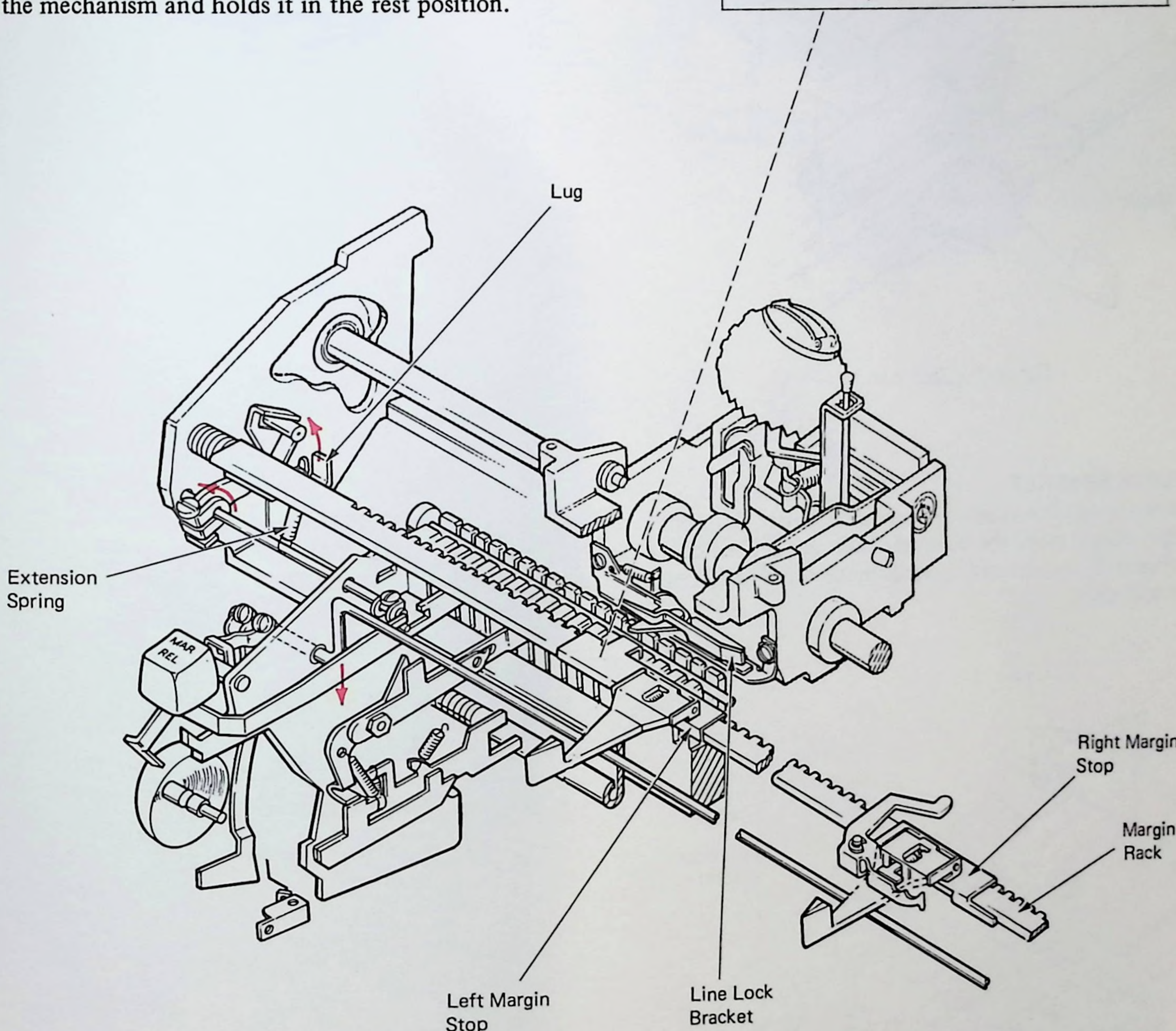


Figure 6 – Margin Release Mechanism

STOP LATCH

To allow the carrier to space or tab through the left margin, the margin stop latch cams clockwise (Figure 7) as it moves past the left margin stop. The margin stop latch will return to rest under its spring tension.

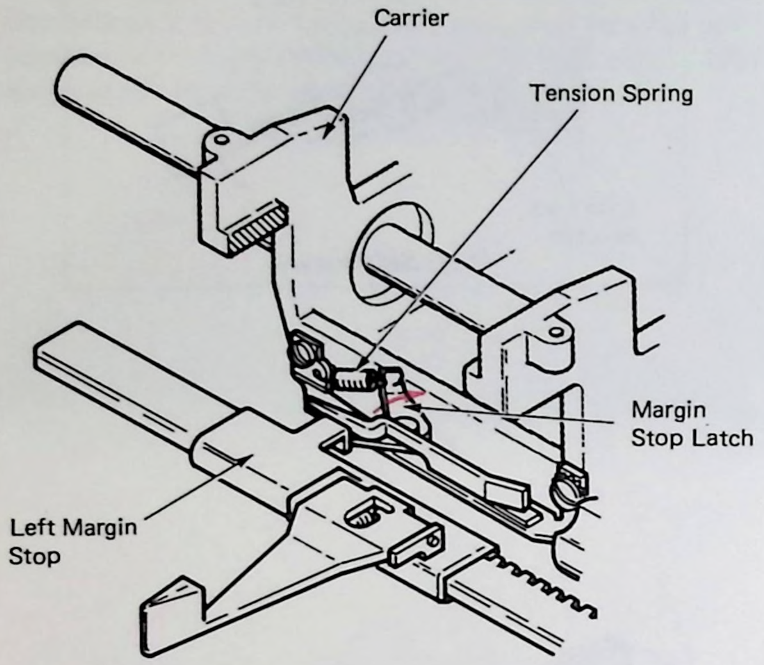


Figure 7 – Stop Latch

LINELOCK BRACKET

To allow the carrier to carrier return or backspace through the right margin stop, the bellringer bellcrank and margin stop (Figure 8) are cammed upwards by the left end of the line lock bracket.

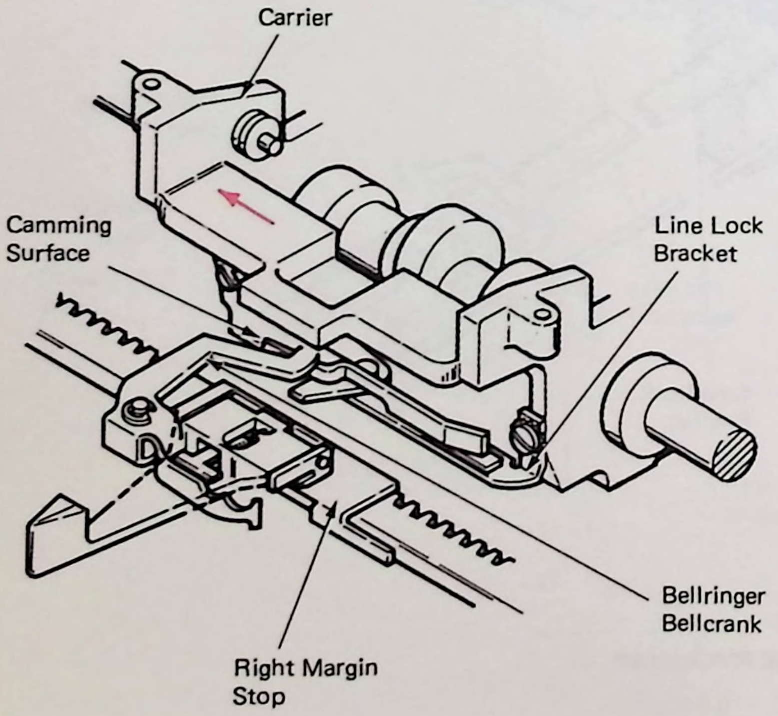


Figure 8 – Line Lock Bracket

MARGIN CONTROL CONTACTS

The margin control contacts are used to relate two conditions to the electronics.

The zone contacts are operated by the zone contact actuator arm mounted on the left-end of the bellringer bail (Figure 9). As the bellringer bellcrank cams onto the first level, the zone contacts are transferred. This instructs the electronics that there is one-inch of line length remaining. This could be an instruction for the electronic device to initiate a carrier return at the next logical point.

The last column contacts are operated by the last column contact actuator which is mounted on the right-end of the bellringer bail (Figure 9). As the bellringer bellcrank cams onto the second level the last column contacts are transferred. This instructs the electronics that the carrier is at the end of the line. The instruction would normally be used by the electronics to return the carrier or stop and wait for further instruction.

NOTE: On early level machines, these contacts were located on the opposite sides of the keyboard. The contacts can be identified by operating the bellringer bail. The first contact to transfer is the zone contact. Some machines may only have one contact. In this case, it will be a last column contact.

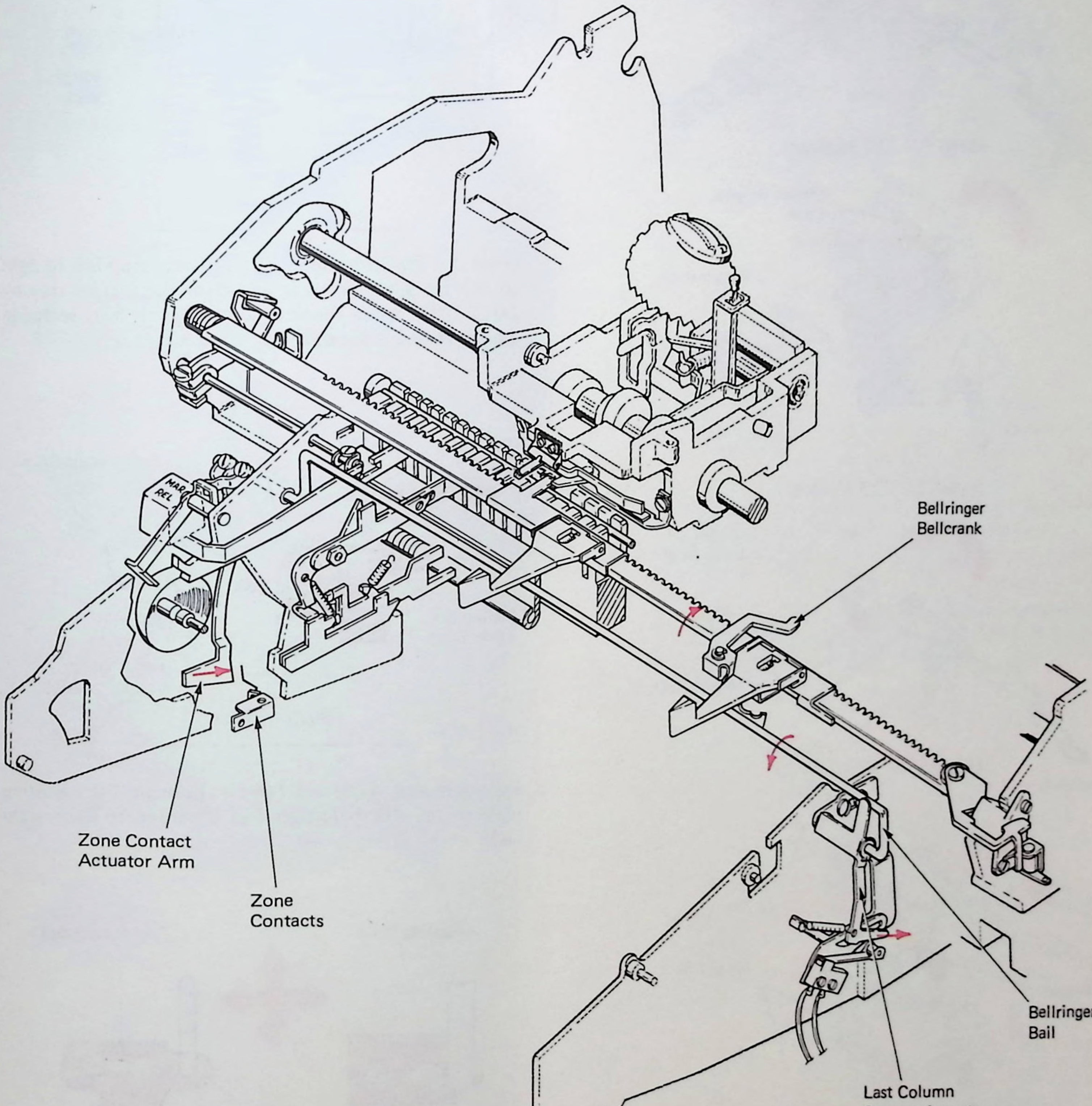
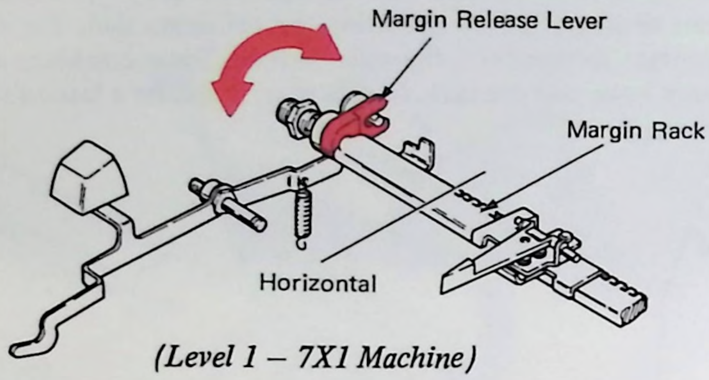
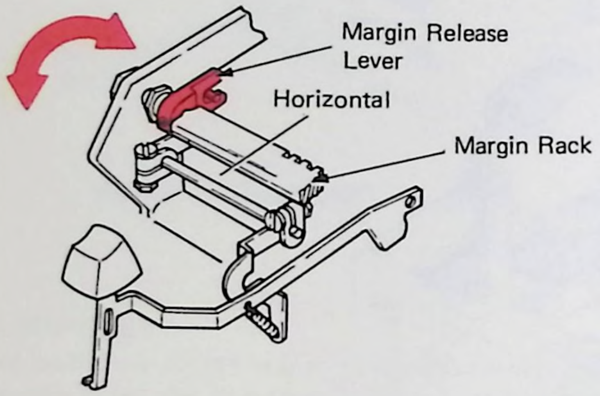


Figure 9 – Margin Control Contacts

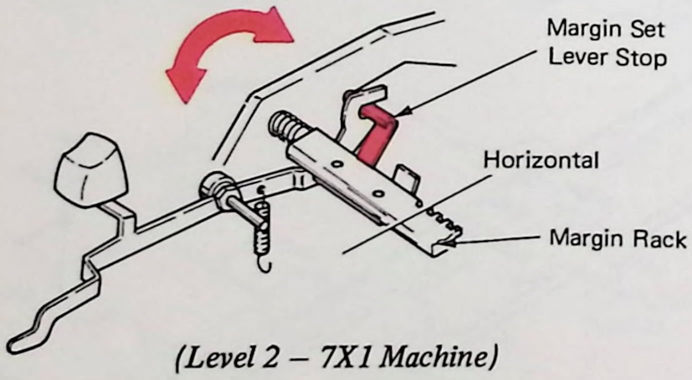
1. *Margin Rack Horizontal* – The margin rack must be adjusted rotationally to rest on a horizontal plane. Level 1 – adjust the margin release lever. Level 2 – form the margin set lever stop on the 7X1 machine and adjust the left margin release lever on the 7X5 machine. Level 7X5 – Adjust left margin release lever laterally for a 1/32" engagement with the margin lever stop.



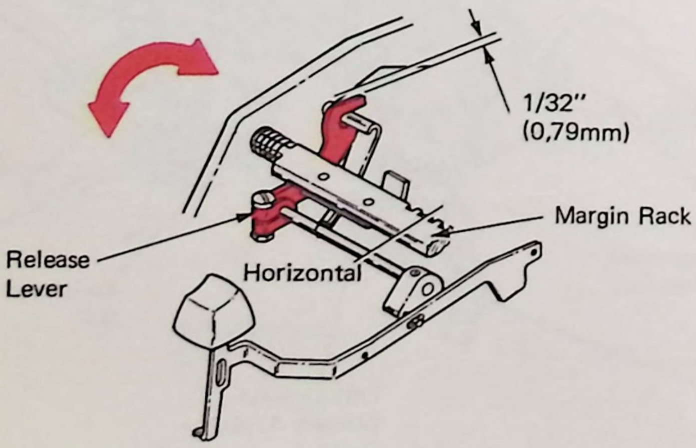
(Level 1 – 7X1 Machine)



(Level 1 – 7X5 Machine)

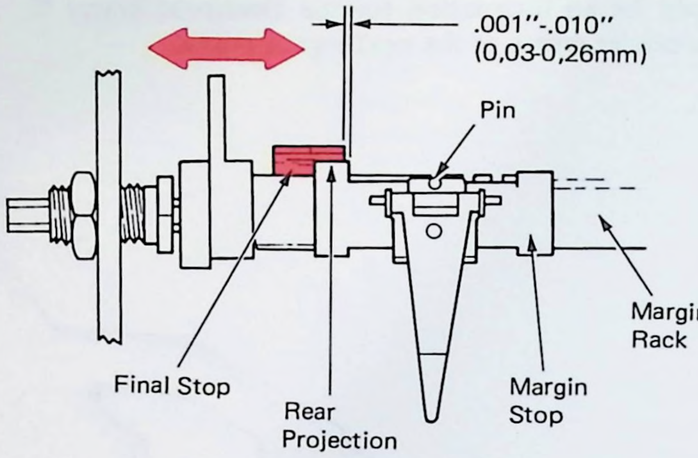


(Level 2 – 7X1 Machine)



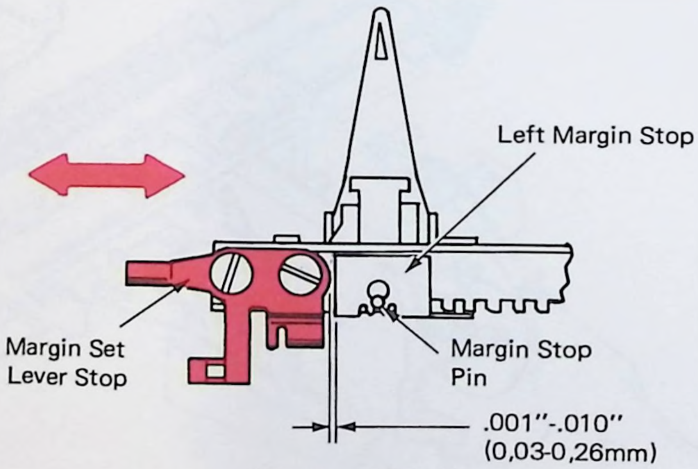
(Level 2 – 7X5 Machine)

2. *Left Final Stop* – Level 1–Form the lug on the final stop (which is welded to the bottom side of the margin rack) for the following condition. The rear projection of the margin stop should be .001"-.010" to the right of the final stop.



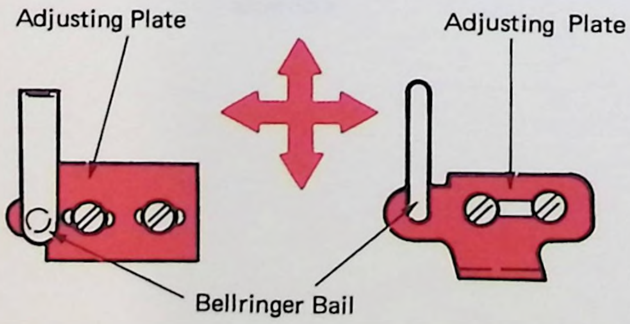
(Top View)

Level 2 – Position the margin set lever stop left to right on the margin rack so it will clear the margin stop by .001"-.010" when the margin stop pin is fully seated in the extreme left tooth of the margin rack.



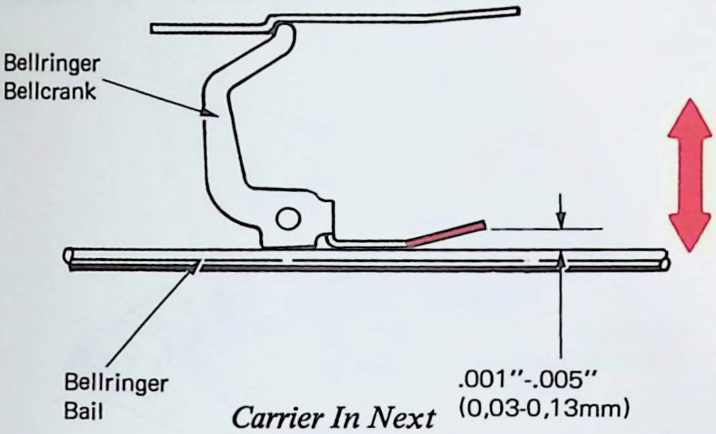
(Bottom View)

3. *Bellringer Bail Adjusting Plate* – Position the adjusting plate so that the bellringer bail is parallel to the margin rack.



(Right Side View)

4. *Bellringer Bellcrank (Level 2 Only)* – Position the carrier in the next to last space from the right margin. Form the bellringer bellcrank for a .001"-.005" clearance between the tip of the bellringer bellcrank and the bellringer bail.

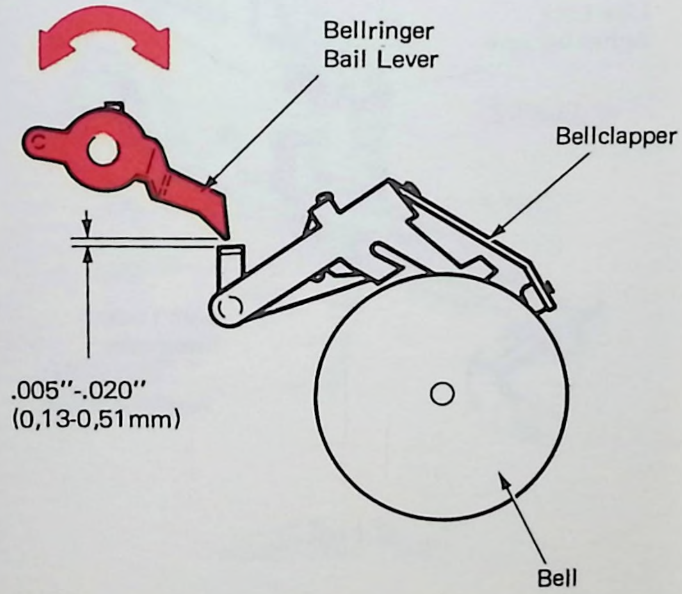


Carrier In Next To Last Space
(Level 2 – Top View)

5. *Bellringer Bail Lever* – Position for two conditions:

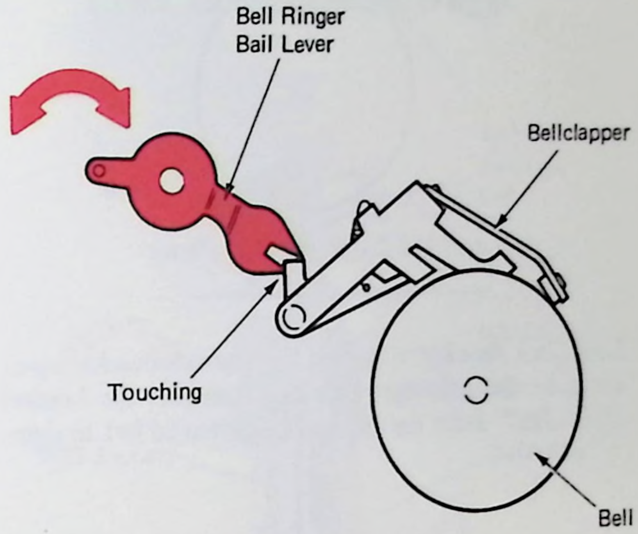
a. Adjust all levels laterally to maintain a .002"-.004" end play of the bellringer bail.

b. Level 1 – with the carrier positioned away from the right hand margin stop, adjust the bell bail lever located on the left end of the bellringer bail to have .005"-.020" clearance with the bellclapper.

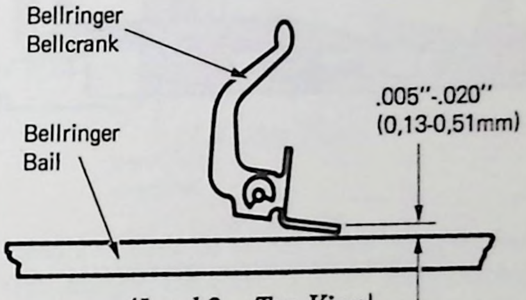


(Level 1 – Right Side View)

Level 2 – With the carrier positioned away from the right margin stop, adjust the bellringer bail lever located on the left end of the bellringer bail so that when the bottom portion of the lever is allowed to contact the underside of the bellclapper bellcrank lever a clearance of .005"-.020" will exist between the bellringer bail and the bellringer bellcrank.

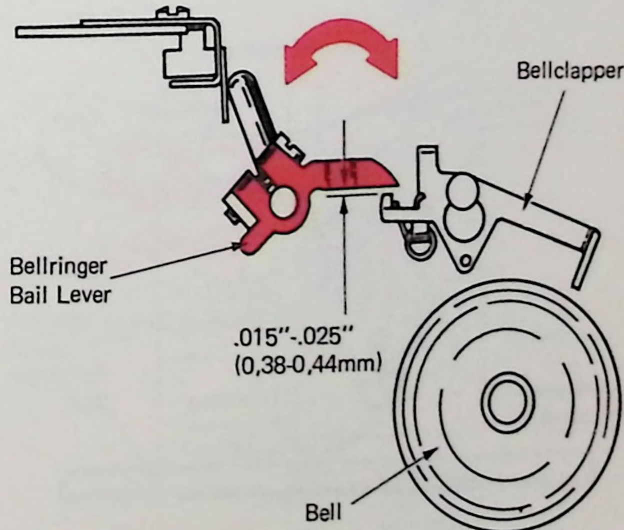


(Right Side View)



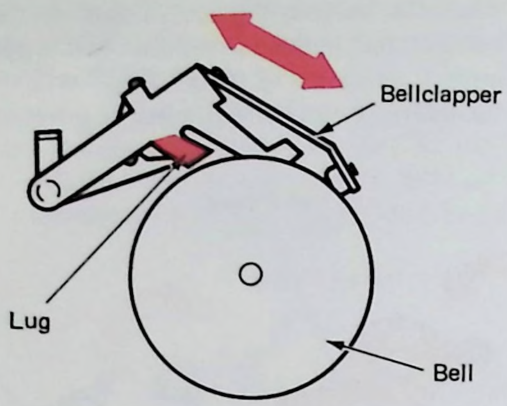
(Level 2 – Top View)

Level 3 – Adjust the bellringer bail lever rotationally for a clearance of .015"-.025" between the bellringer bail lever and the bellclapper.



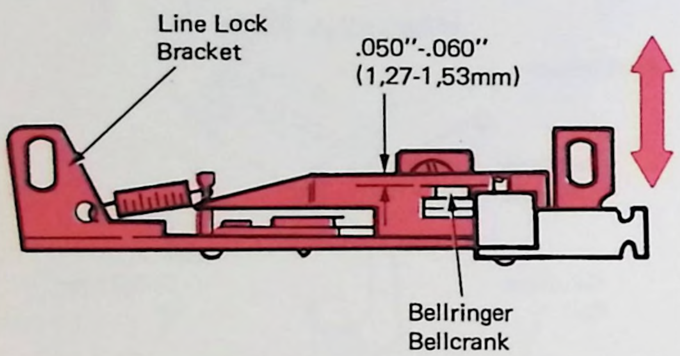
(Level 3 – Right Side View)

6. *Bellclapper – Levels 1 and 2 only* – Form the lug to cause the bell to ring 10 to 13 spaces from the right-hand margin setting.



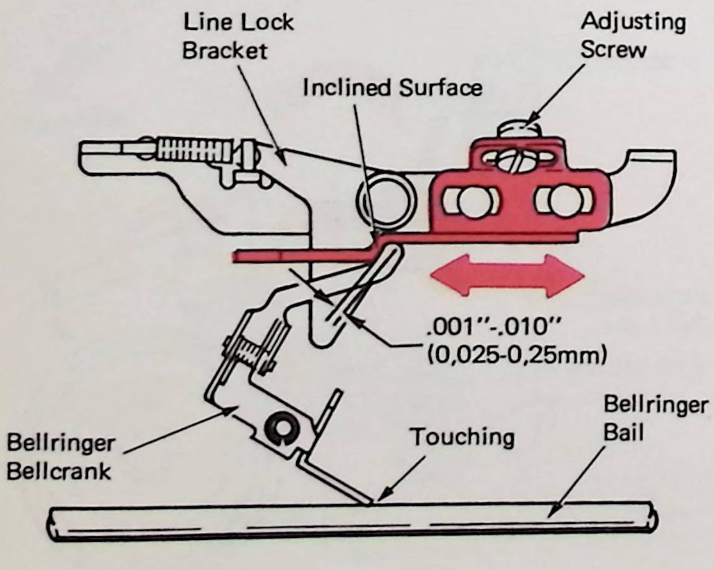
(Level 1 & 2 – Right Side View)

7. *Line Lock Bracket* – Adjust the linelock bracket up or down so the bellringer bellcrank contacts the bracket .050"-.060" from the top and is horizontal left to right.



(Front View)

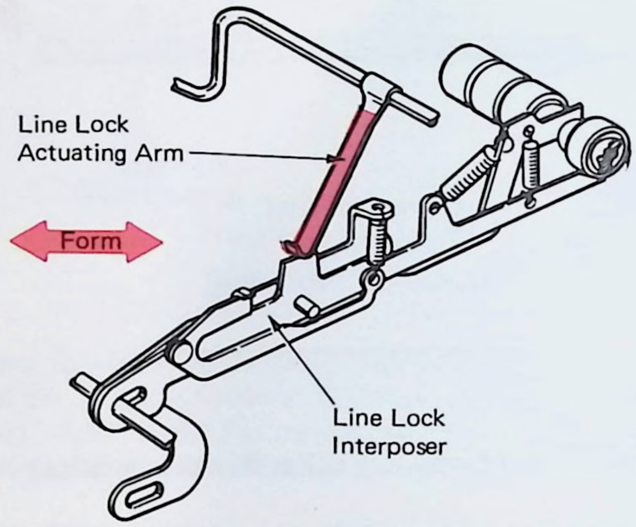
8. *Linelock Bracket Plate* – Position the carrier in the next to last space from the right margin. Adjust linelock bracket plate for a clearance of .001"-.010" between the bellringer bellcrank and the inclined surface.



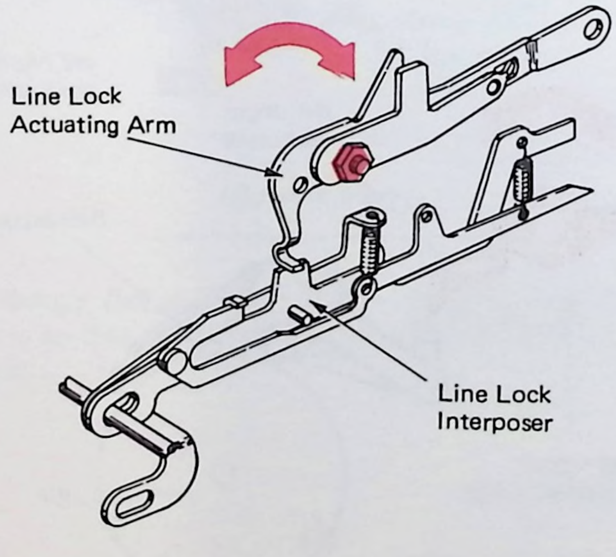
(Top View)

9. *Linelock* – Adjust so that the linelock interposer is fully depressed when the carrier pointer is in line with the right margin set lever. Level 1 – Form the linelock actuating arm on the bellringer bail. Level 2 – Adjust the eccentric on the linelock actuating arm.

CAUTION: The linelock should not be felt in the space preceding the desired locking point. The linelock actuating arm should not be choked off so as to bind the carrier as the spacebar is operated through the linelock.

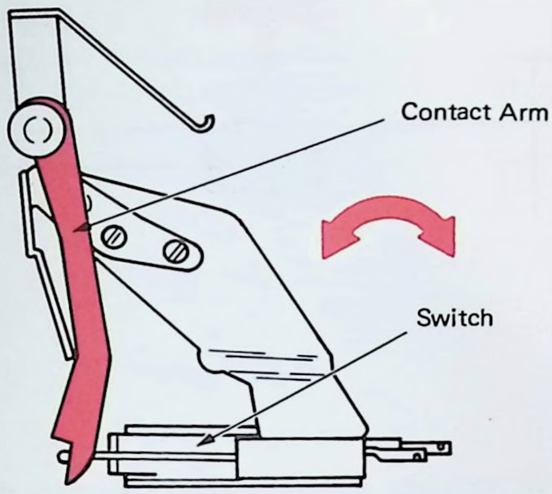


(Level 1)



(Level 2)

10. Zone Contact – Adjust the contact arm to transfer the switch 10 to 13 spaces from right margin setting.

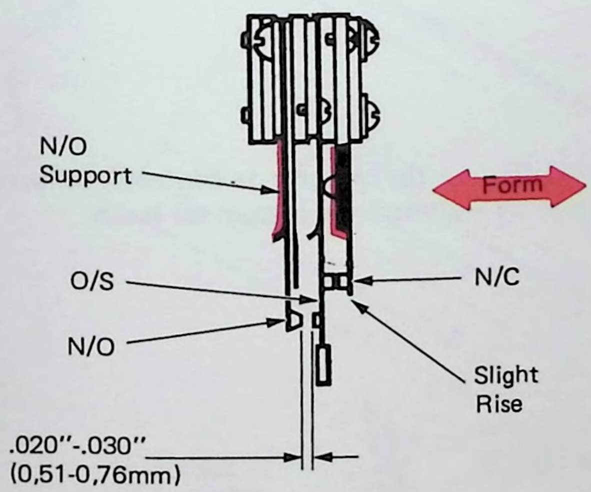


(Left Side View)

11. Last Column Contacts Level 1 –

a. Form the N/C support so that the O/S (at rest) produces a slight rise of the N/C contact.

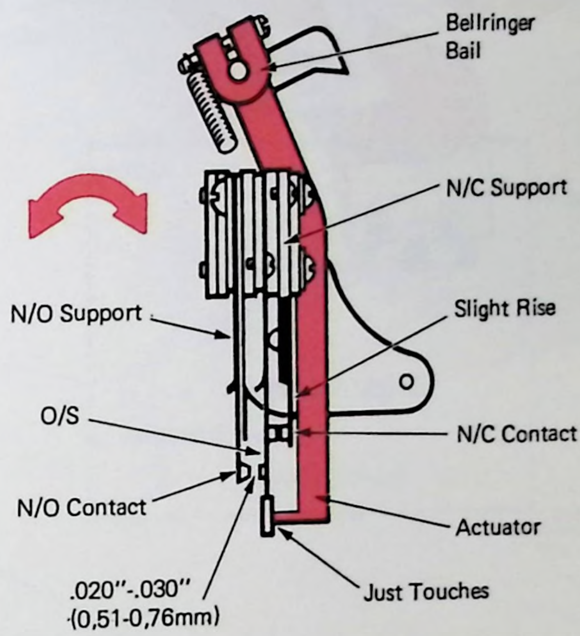
b. Form the N/O support so that the N/O contact clears the O/S by .020"-.030".



(Left Side View)

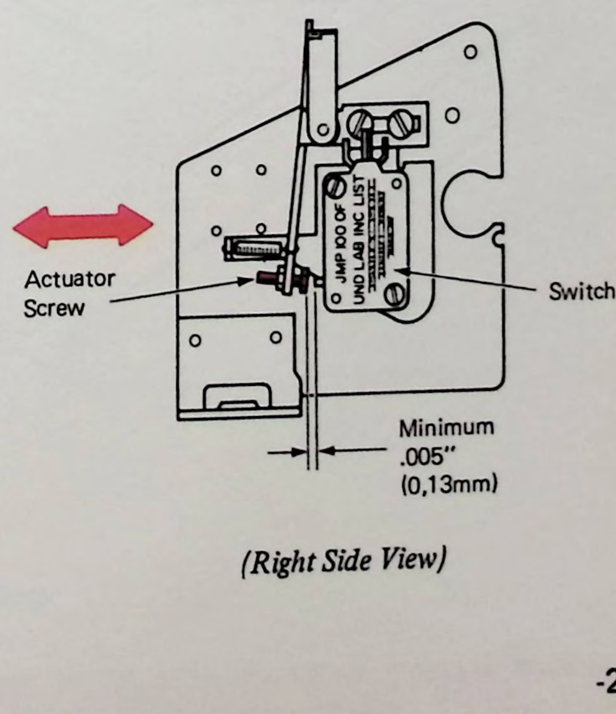
c. Position (carrier in next to last space) the contact actuator on the bellringer bail so that it just touches the O/S. When positioning the actuator, all back lash must be held out of the actuator to line lock bracket linkage.

d. With the carrier at the next to last space, the contact transfer must be complete (and without bounce) in one escapement operation.



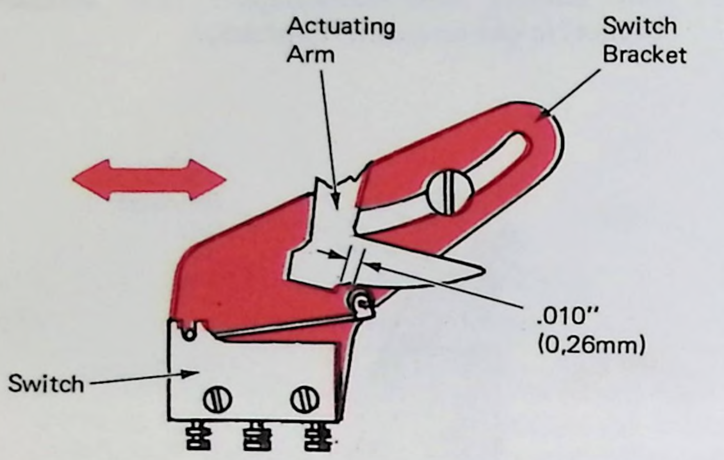
(Left Side View)

Level 2 – With the carrier in the last space from the right margin, the actuator screw should be adjusted to transfer the switch with one escapement operation. A minimum clearance of .005" should be maintained with the carrier in the last space.

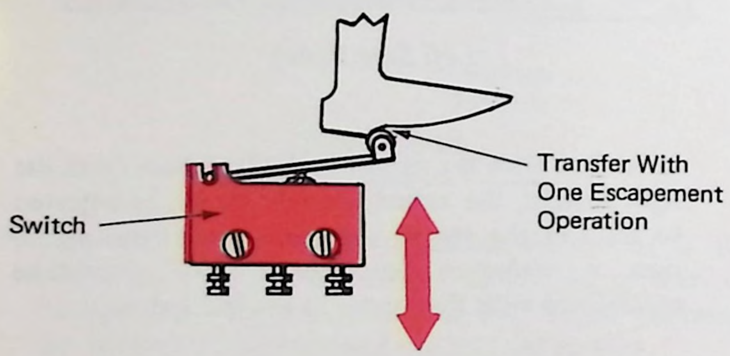


(Right Side View)

Level 3 – The switch bracket should be adjusted for a clearance of .010" between switch roller and the camming surface on the actuating arm. With the carrier positioned in the last space, the switch should be adjusted to transfer with one escapement operation.



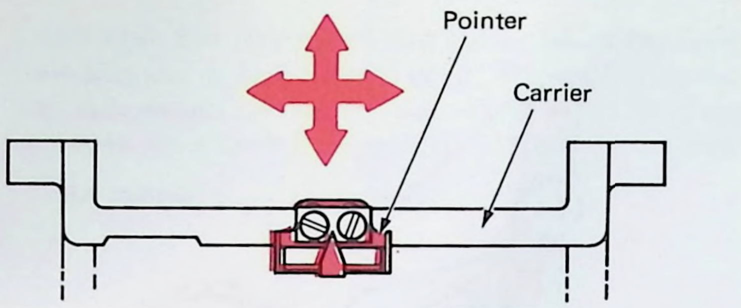
(Right Side View)



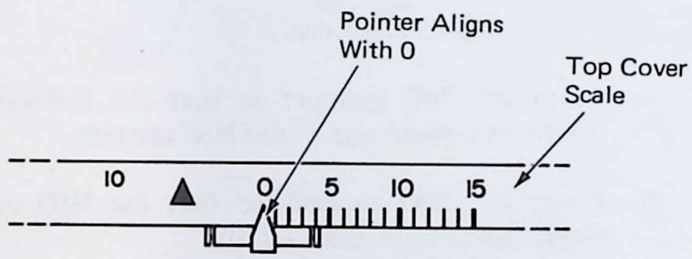
(Right Side View)

---

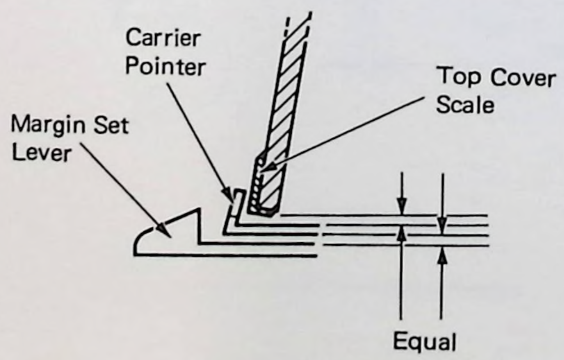
12. *Carrier Pointer* – With the carrier at the extreme left margin, adjust the carrier pointer horizontally and vertically for the following:



a. Horizontally so the pointer aligns with the 0 on the top cover scale.



b. Vertically so the pointer is centered between the top cover scale and the margin set levers.



COVERS OPERATIONAL THEORY

There are three types of covers: tilt-up, console mount, and ring mount. First, we will describe the tilt-up covers, and then the differences between them and the other two types.

TILT UP COVERS

The cover assembly is composed of three major sections. They are the top cover, center cover and bottom cover (Figure 1).

The center cover assembly has the paper guide attached to it. The paper guide may be removed by sliding the guide to the extreme right and pulling straight downward. A section of the cover material has been removed on the rear side to permit the guide to slide off easily.

A margin scale is attached to the lower lip of the top cover. The scale is graduated to correspond to the pitch of the typewriter. The margin scale is attached to the top cover by an adhesive that becomes active when IBM cleaning fluid is applied.

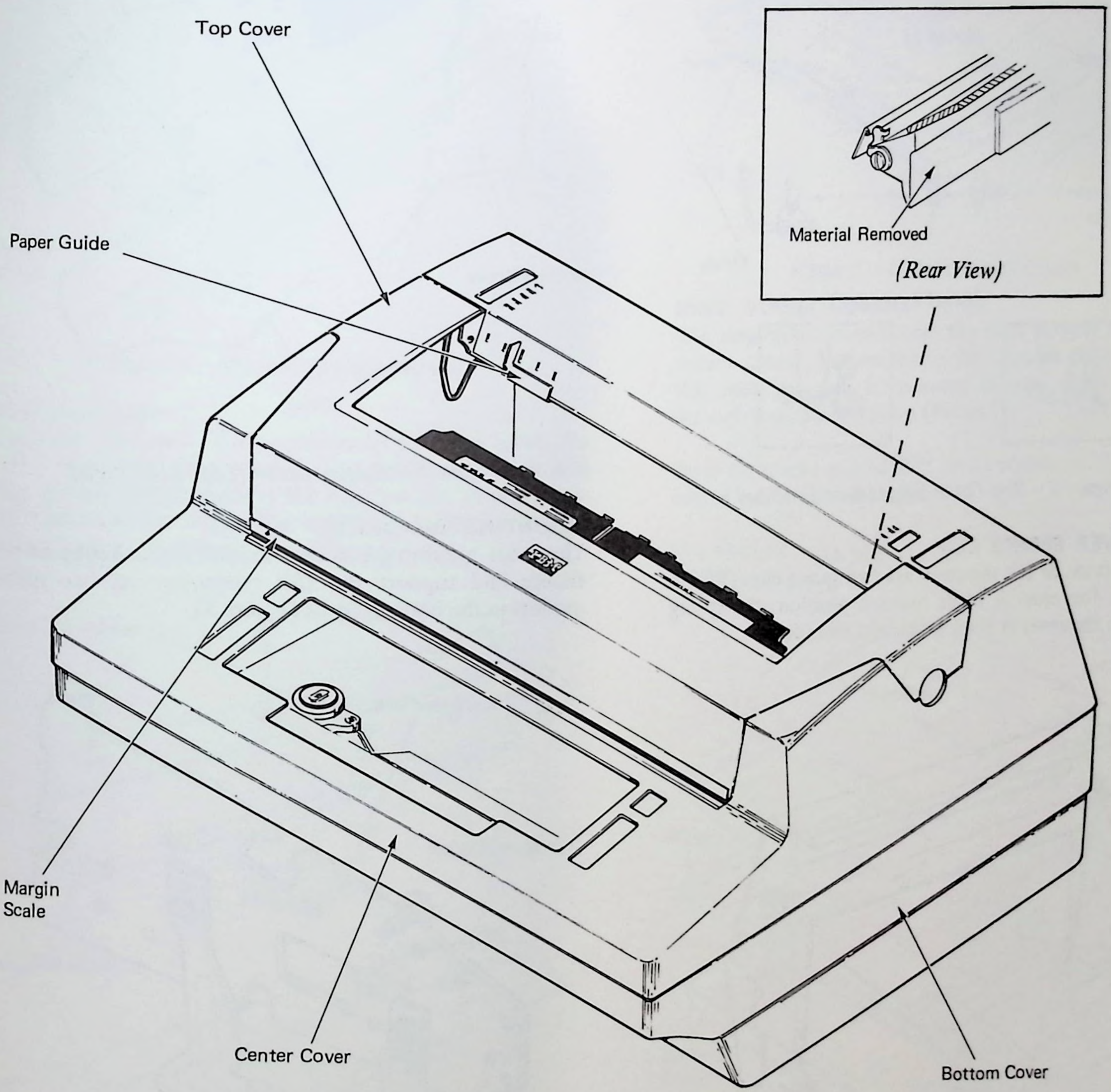


Figure 1 – Covers

TOP COVER HINGE

The top cover is attached to the center cover by a hinge at the rear. The hinge brackets are adjustable front to rear to allow for proper fit between the top cover and center cover. The hinge contains a detent that prevents the top cover from falling when it is in the raised position (Figure 2).

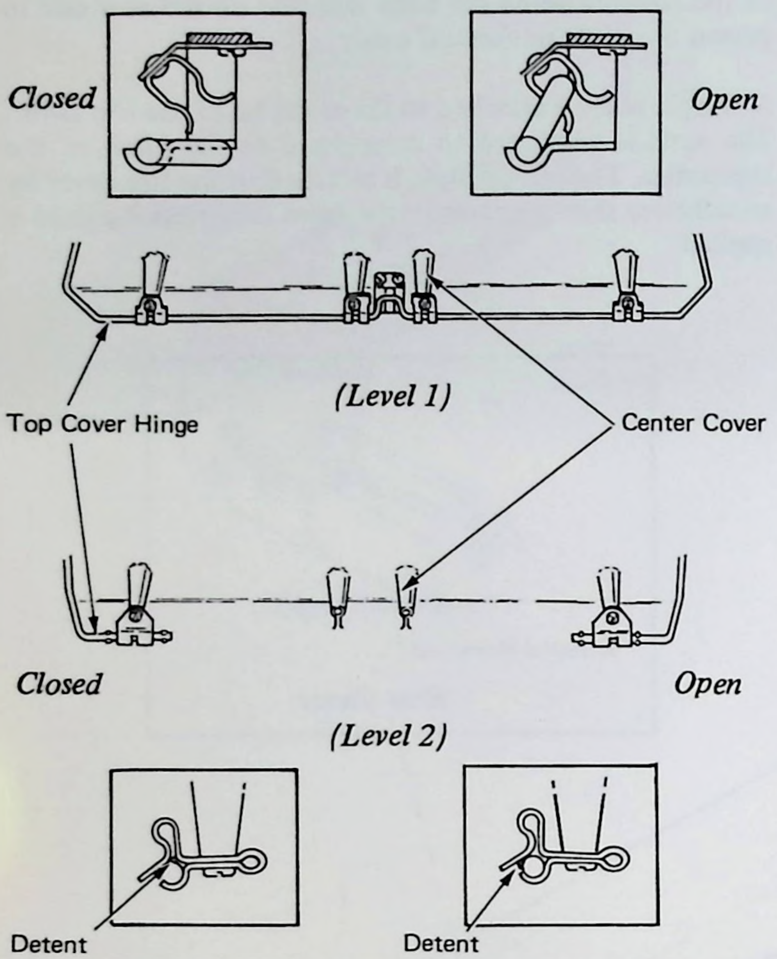


Figure 2 – Top Cover Hinge (Bottom View)

TOP COVER SPRING CLIP

Near the front of the top cover are two spring clips (Figure 3). When the cover is in its lowered position, the spring clips latch the cover in place to prevent vibration.

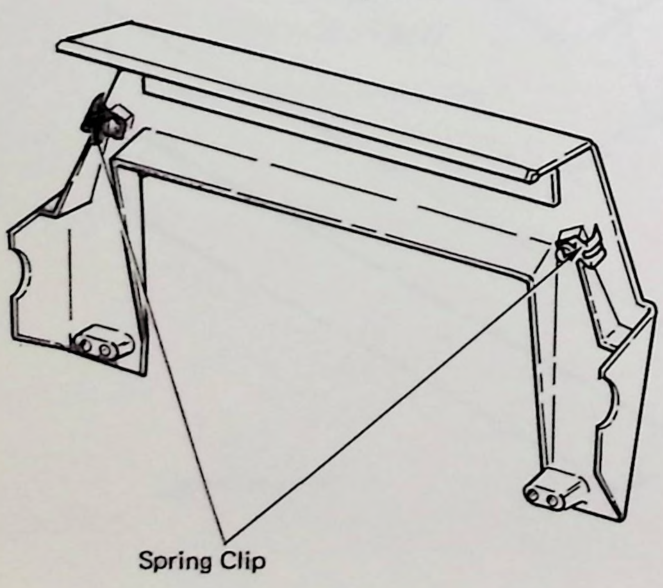


Figure 3 – Top Cover Spring Clip

CENTER COVER

Mounted on the bottom edge of the center cover are four ball studs (Figure 4). The ball studs serve to securely mount the center cover to the bottom cover by snapping into four catches mounted in the bottom cover.

The vent grille for the motor is mounted in the rear of the center cover.

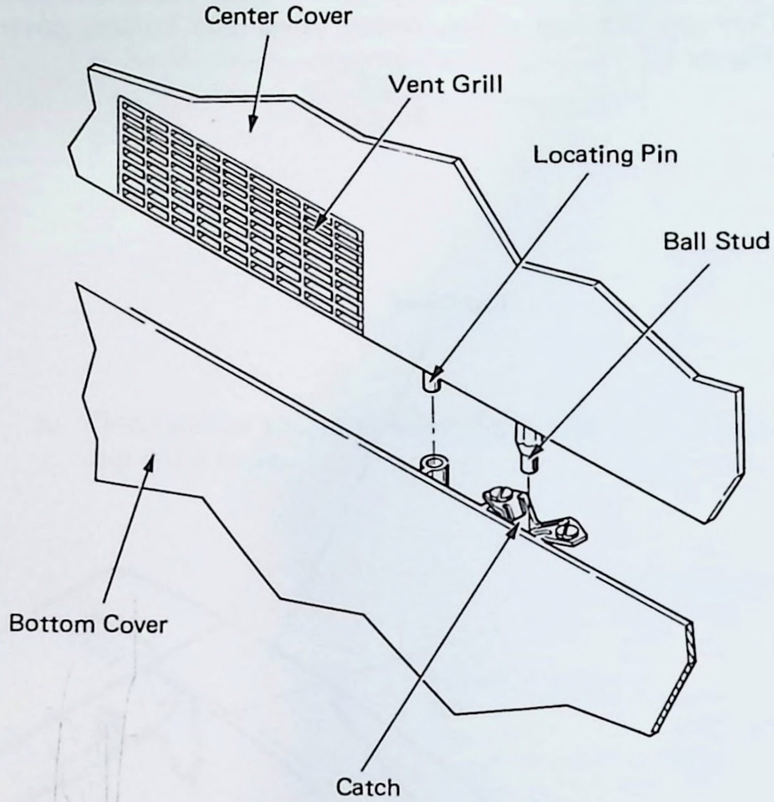


Figure 4 – Center Cover (Left Rear View)

MOUNTING BRACKETS

The front mounting brackets mount to the keyboard side frames and support the I/O typewriter on two rubber mounts in the bottom cover (Figure 5).

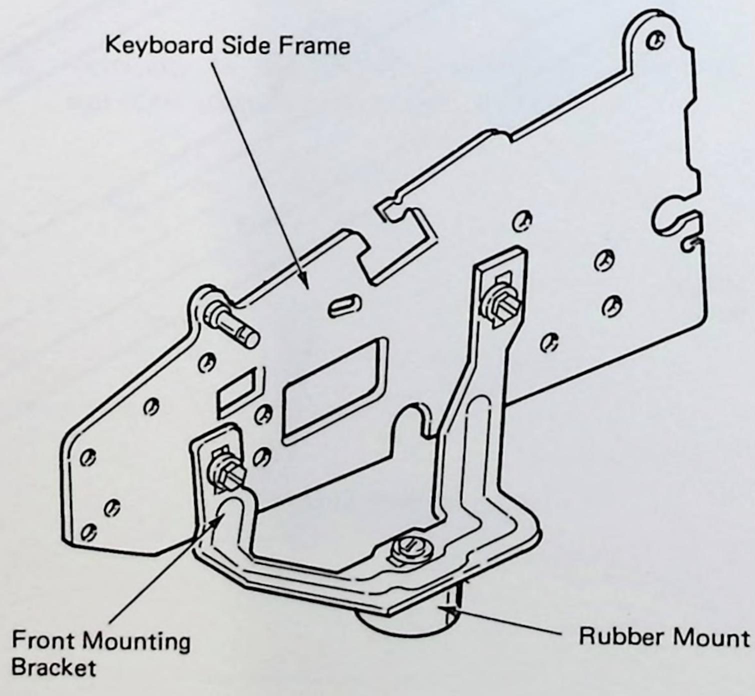


Figure 5 – Front Mounting Bracket

The rear mounting brackets support the I/O typewriter by resting on two rubber mounts located in the rear of the bottom covers (Figure 6). A guide roller, on the rear mounting brackets, is used to roll the I/O typewriter into the service position. The guide rollers run on two tracks which are a part of the bottom cover.

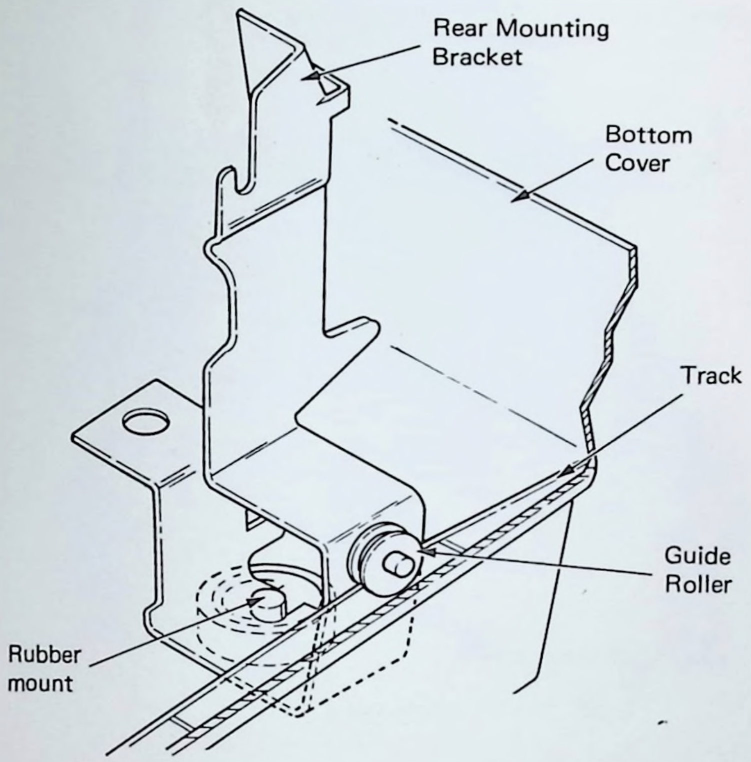


Figure 6 – Rear Mounting Bracket

DUST SHIELDS

There are two levels of dust shields located just below the carrier (Figure 7). The level 2 dust shields are plastic and snap into the power frame at the rear and into three mounting brackets at the front. The level 1 dust shields are metal and are held in place by three screws and a nut.

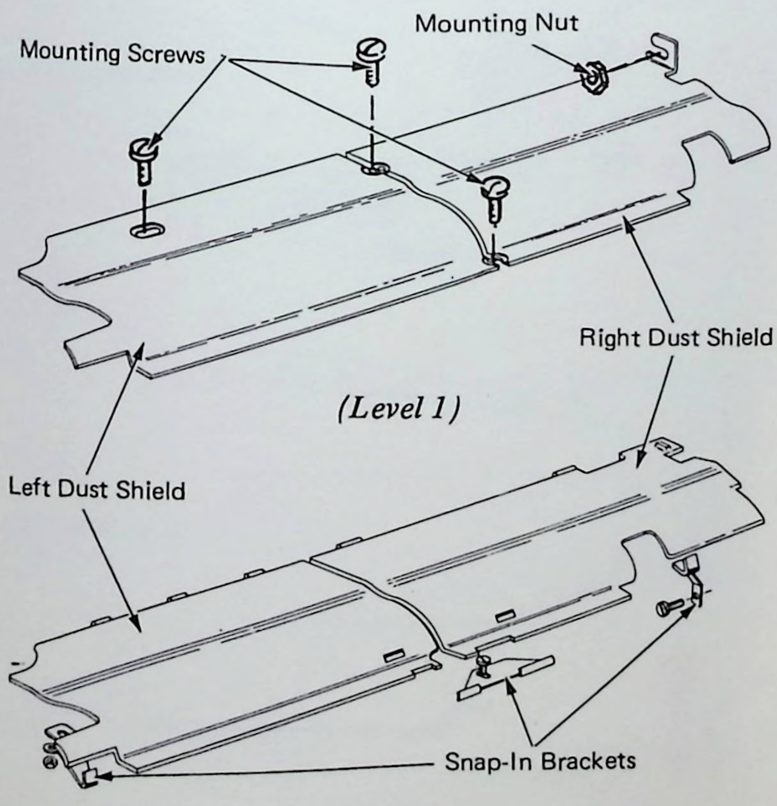


Figure 7 – Dust Shields

CONSOLE MOUNT COVERS

The purpose of the console mount style of covers is to allow the I/O to be suspended in a hole in a desk top or console unit. The I/O is suspended by installing a ring on the top of the bottom cover (Figure 8). On some MT/ST I/O's, this ring is mounted to the bottom cover with screws.

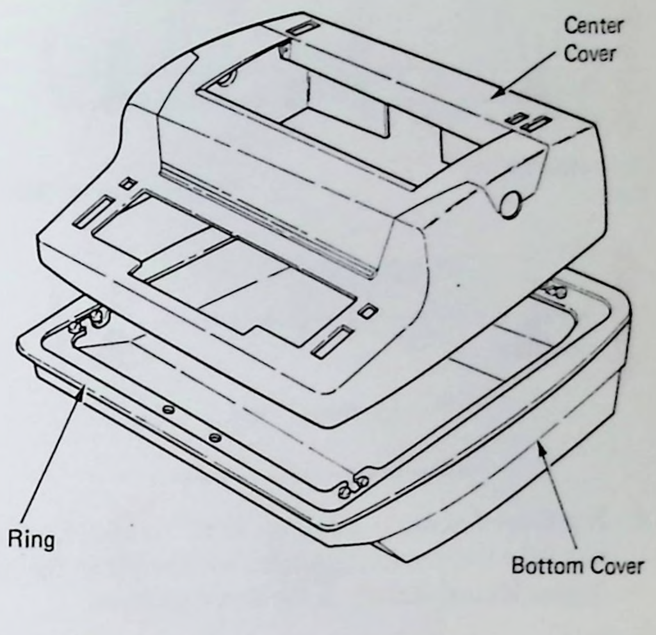


Figure 8 – Console Mount Covers

RING MOUNT COVERS

The ring mount covers serve the same purpose as console mount covers, but mount to the machine differently. In this case, the ring is mounted directly to the machine through four shock mounts (Figure 9).

Both the center and bottom covers connect to the ring by sets of ball studs and catches.

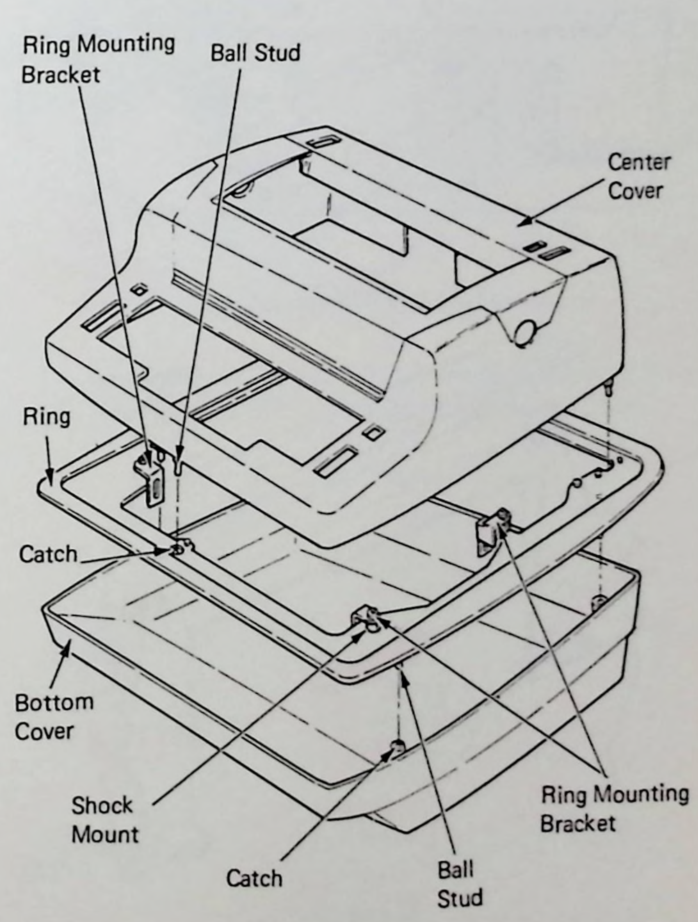
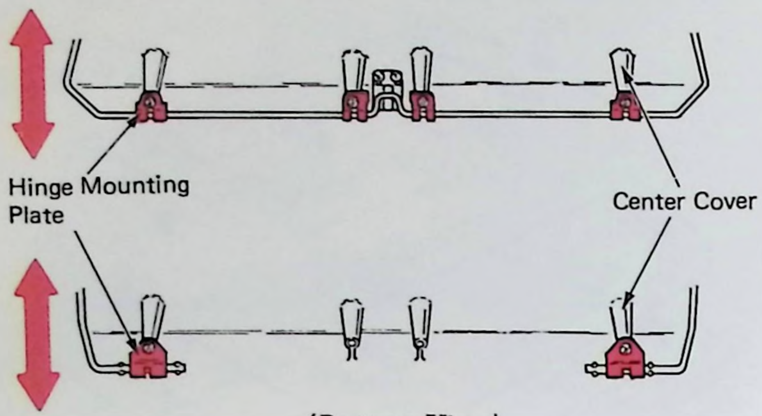


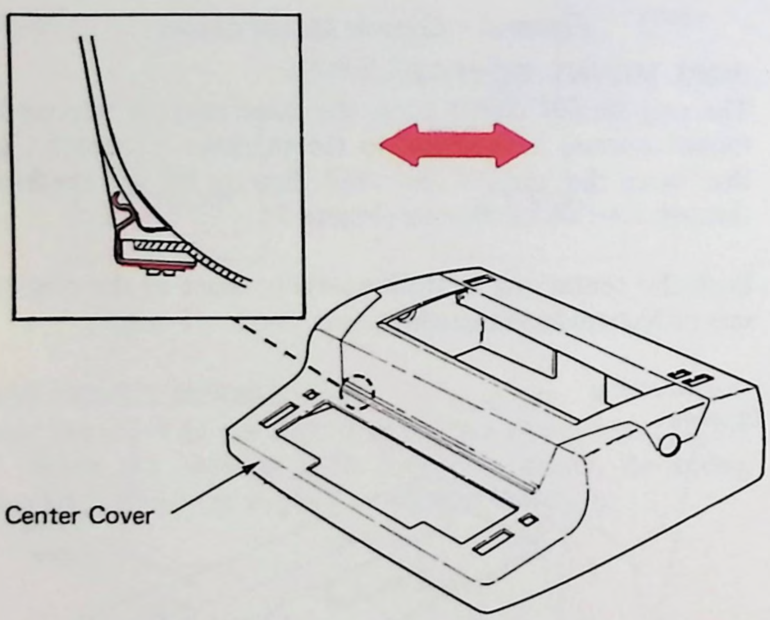
Figure 9 – Ring Mount Covers

1. *Top Cover Hinge* – The top cover hinge should be adjusted so the contour of the top cover matches the contour of the center cover. Position the hinge mounting plate front to rear to obtain this condition.

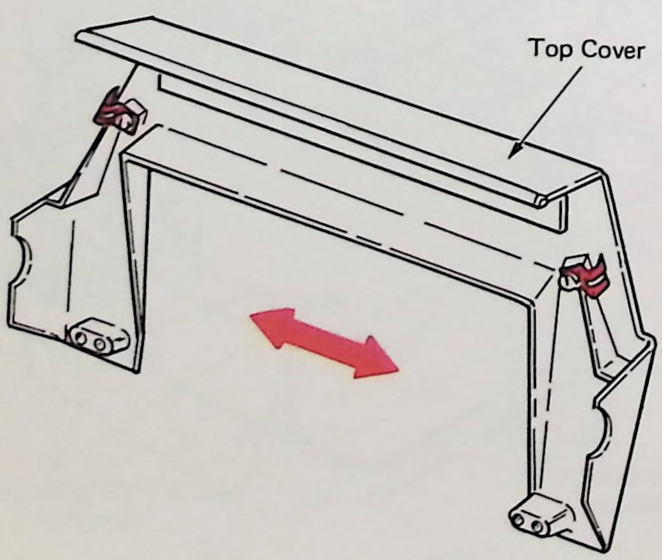


(Bottom View)

2. *Top Cover Latches* – Form the level 1 latches front to rear and adjust the level 2 latches left to right so the top cover is latched securely in the closed position.

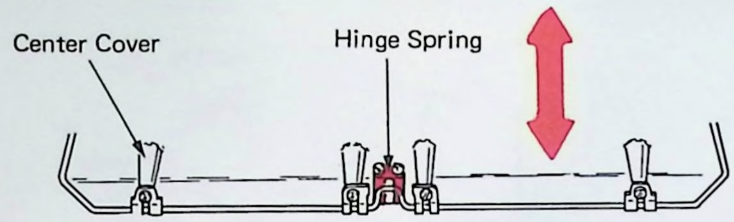


(Level 1)



(Level 2)

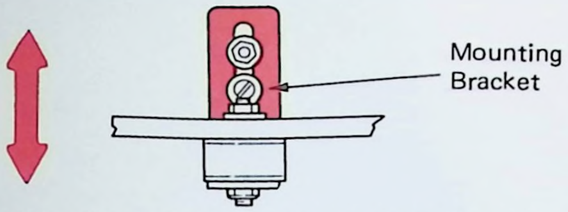
3. *Hinge Spring (Level 1 Only)* – The hinge spring should be positioned front to rear so the top cover hinge is detented and held in the open position.



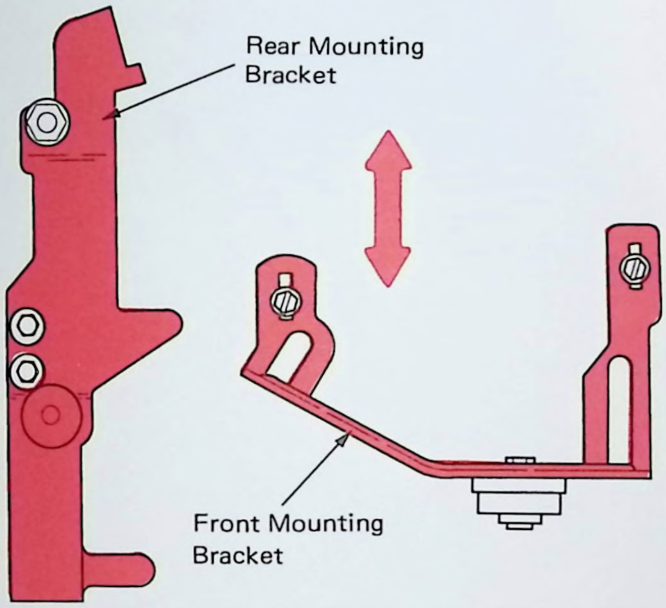
(Bottom View)

4. Printer Position

a. By adjusting the front and rear mounting brackets vertically, position the printer to meet the following conditions:

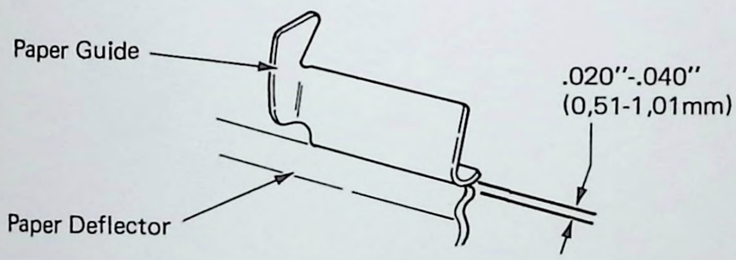


Ring Mount Covers (Right Side View)

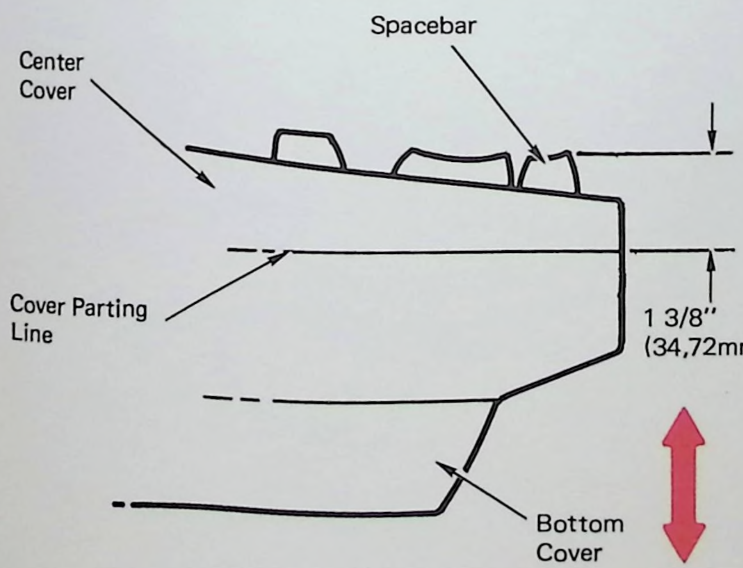


Tilt Up Covers (Right Side View)

The clearance between the paper guide and the deflector will be .020"-.040".

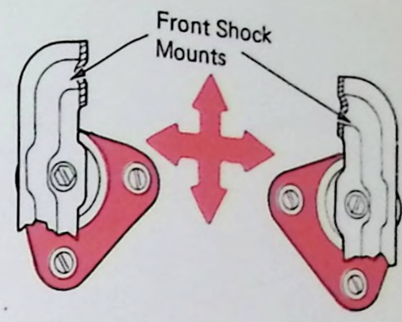


The top of the spacebar will be 1 3/8" above the parting line of the cover.

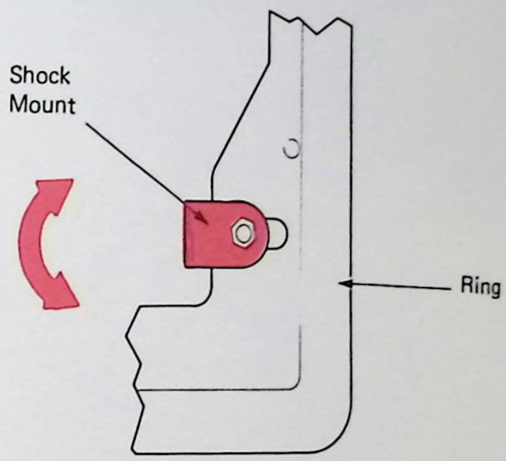


(Left Side View)

b. By adjusting the front shock mounts on tilt-up covers and all shock mounts on ring mount covers, position the printer to meet the following conditions:

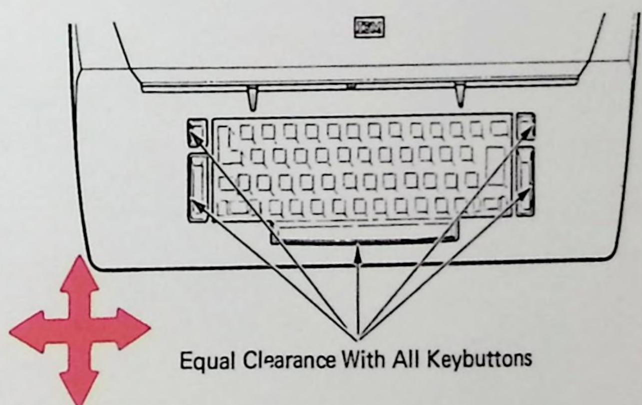


Tilt Up Covers (Top View)

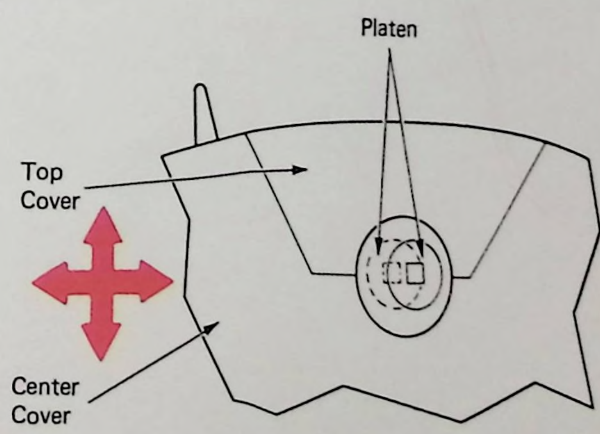


(Top View)

All of the openings for the keybuttons will have equal clearance on each side.



The platen will clear the covers with the copy lever operated to the extreme front and rear position.



(Left Side View)

The purpose of the Film Ribbon Mechanism is to lift the ribbon into the path of the typehead during a print operation; and to feed the ribbon from the supply spool to the take-up spool.

The film ribbon feature assures maximum print quality since the release characteristics of the dry ink used on the film ribbon provides a sharper image than other types of ribbons. Because of the total release of the ink, each film ribbon can be used only once. This feature is available only on machines equipped with the dual velocity print mechanism. There are two levels of film ribbon mechanisms. Level 2 will be described first in detail and the differences in the level 1 mechanism are described at the rear of this section.

The film ribbon mechanism mounts on the carrier assembly (Figure 1). The supply spool of ribbon installs on a permanent supply spool on the left side of the carrier. The plastic core of the supply spool and the permanent supply spool rotate as a unit during a ribbon feed operation. As the ribbon comes from the supply spool, it threads around the ribbon lift guides to the take-up spool. The take-up spool is a disposable, transparent spool mounted on the right side of the carrier. Once the ribbon has been used and fed to the take-up spool, both the take-up spool and the plastic core from the supply side are removed and discarded. The new ribbon to be installed comes equipped with its own take-up spool fastened to the end of a clean leader (Figure 1).

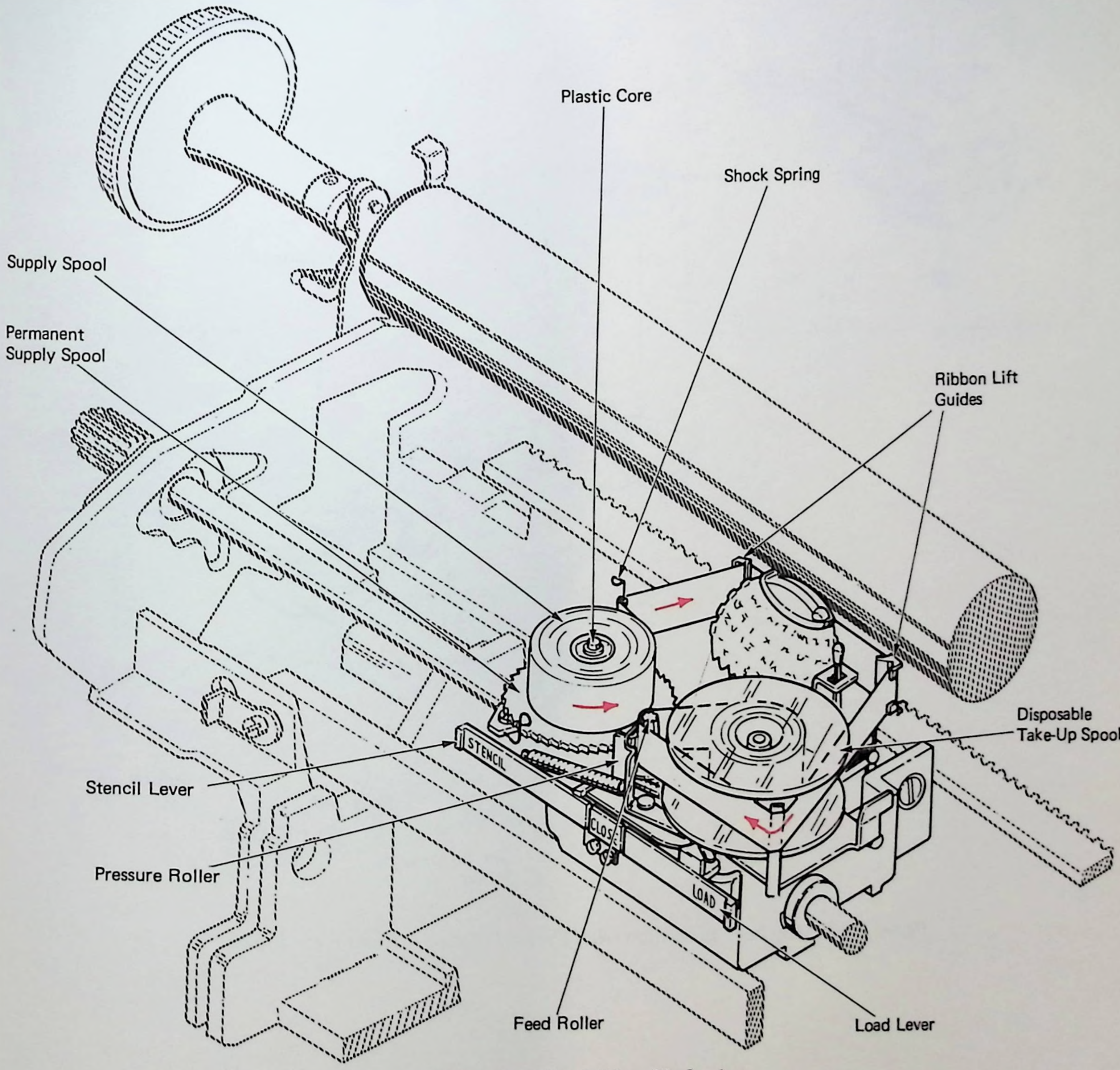


Figure 1 – Film Ribbon Mechanism

RIBBON FEED

The ribbon feed cam, which is keyed to the print sleeve, supplies the motion for ribbon feed. The motion from the cam is transmitted through an adjustable stud to the cam follower, which drives the feed pawl (Figure 2). The cam follower mounts on a bracket that is fastened to the front carrier casting by two hex-headed screws. An extension spring, anchored to one of these screws, loads the cam follower against the cam. The feed pawl mounts at the top of the cam follower by a shouldered rivet and is spring loaded into engagement with the ribbon feed and lift wheel (Figure 2).

The ribbon feed and lift wheel contains sixteen feed windows laid out in a circular pattern. During the first half of a print cycle, the cam follower will ride to the low point of the feed cam under spring tension. The feed pawl attached to the top of the cam follower will move to the rear camming out of one window and dropping into the next. As the feed cam follower and feed pawl will be powered forward causing the feed and lift wheel to be rotated clockwise. The wheel will feed one window during each print cycle.

A ribbon feed roller is mounted to the top of the feed and lift wheel and is held secure by a left hand threaded screw (Figure 2). The feed roller rotates clockwise each time the feed and lift wheel is rotated. The used ribbon passes around the feed roller just prior to winding onto the take-up spool. A pressure roller holds the ribbon against the feed roller so that the amount of rotation of the feed roller will govern how much ribbon is fed on each cycle.

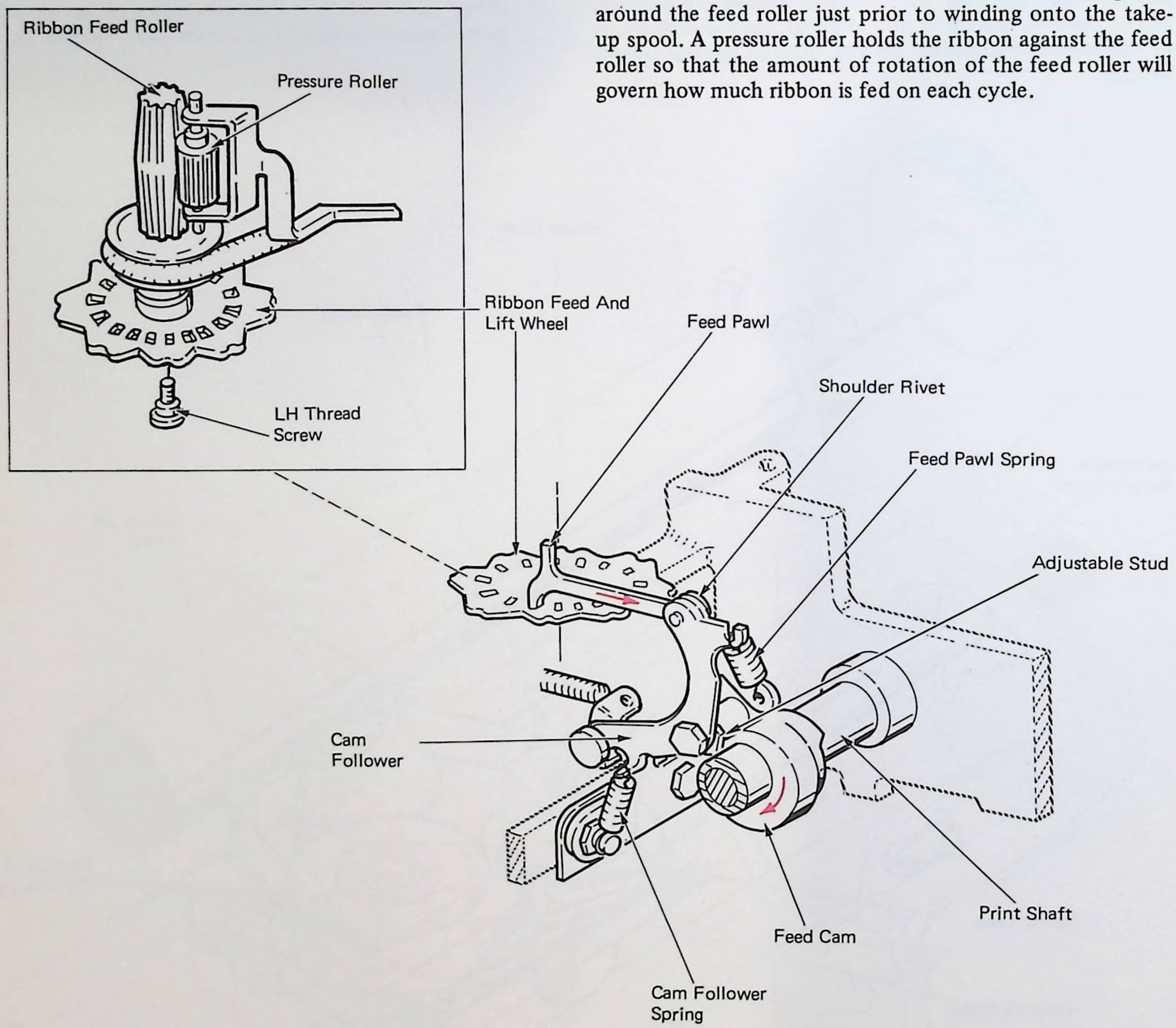


Figure 2 – Ribbon Feed Mechanism (Half Cycled Position – Right Rear View)

RIBBON TAKE-UP

Once the ribbon leaves the feed roller, the used ribbon is wound onto the transparent take-up spool. The take-up spool receives its motion from the feed mechanism by a friction type spring drive system (Figure 3).

A drive pulley located directly below the feed roller rotates with the feed roller during a ribbon feed operation. This drive pulley supplies the motion to the take-up pulley through a drive spring. The take-up pulley, driven by the drive spring, rotates about the take-up spool pivot stud and is held in place by a "C" clip. The shape of the belt groove in the take-up pulley is designed slightly different from that of the drive pulley. This is to permit all of the necessary slippage of the drive spring to occur at the take-up pulley and not at the drive pulley. This slippage is necessary to ensure the take-up spool will wind all of the ribbon. Two hooked lugs on the top face of the take-up pulley project into corresponding slots in the bottom of the transparent take-up spool. These lugs provide a locking connection between the take-up pulley and the disposable take-up spool.

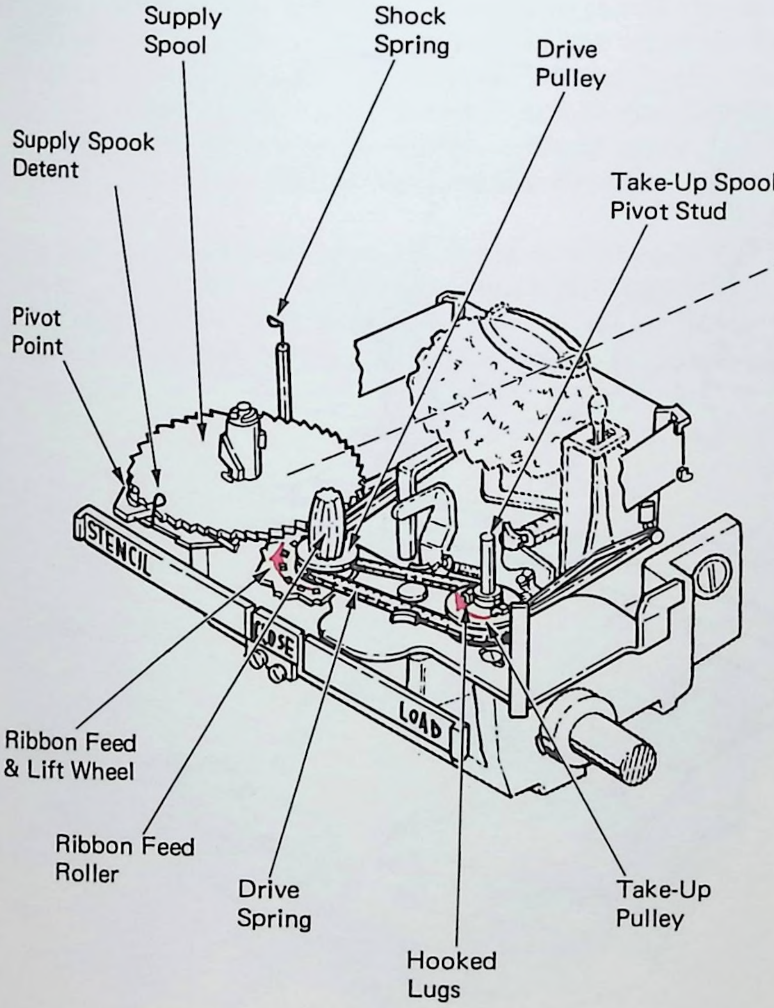


Figure 3 – Take-Up Spool Drive

To maintain stable ribbon tracking the ribbon must be kept slightly taut throughout the ribbon path. The ribbon is kept taut by means of a shock spring and detent (Figure 4). As the ribbon is pulled through the ribbon path, it applies a slight inward pull on the shock spring. The supply spool detent, located on the front of the shock spring, momentarily releases the supply spool and allows it to turn. After each feed operation, the detent re-engages the supply spool to hold the ribbon taut.

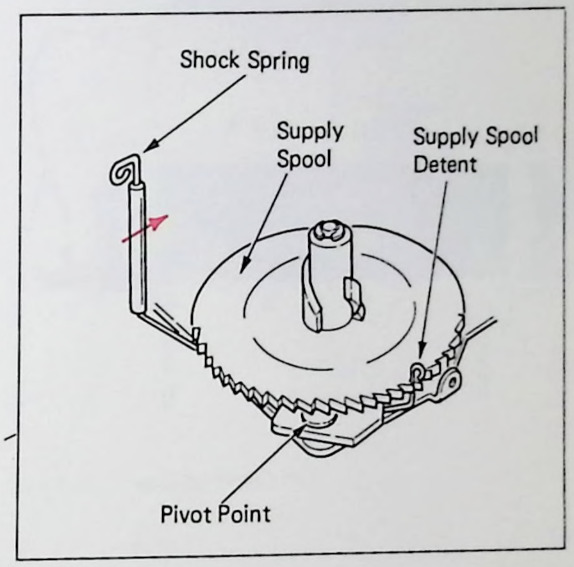


Figure 4 – Shock Spring And Detent

RIBBON LIFT

The ribbon lift cam is a single lobe cam that is setscrewed to the left side of the print sleeve. Each time a print cycle occurs, the cam makes one complete revolution (Figure 5).

The ribbon lift cam follower pivots on the carrier assembly above and to the rear of the cam. Each revolution of the cam raises the cam follower. The end of the ribbon lift control link fits into an elongated slot in the cam follower. The ribbon lift guide arms rest on the control link and pivot at the front of the carrier casting. As the cam follower is raised, the control link forces the ribbon lift guide assembly to pivot at the front and raise the rear of the assembly. A flat link from each side of the ribbon lift guide attaches to two pins at the front of the carrier to maintain the ribbon lift guide in a vertical position.

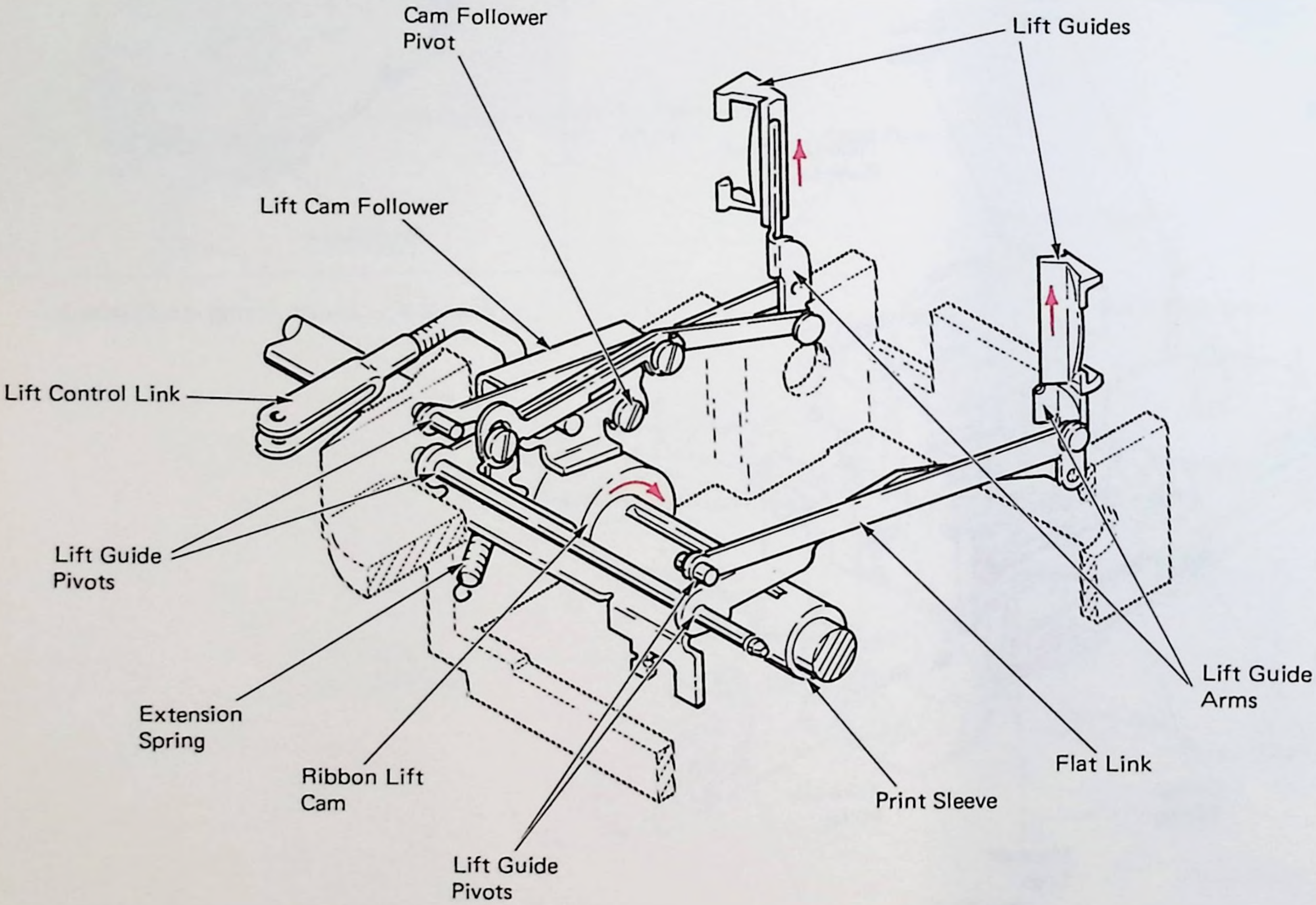


Figure 5 – Ribbon Lift Mechanism

To obtain the desired number of characters per spool of ribbon, a 9/16" wide ribbon is used. By varying the ribbon lift position for each character, a greater number of characters can be typed on a given length of ribbon.

The different lift positions are determined by the ribbon feed and lift wheel (Figure 6). The camming lobes on the perimeter of the wheel govern the position of the lift control link during each ribbon feed operation. These lobes, which correspond to each feed window, produce the four lift positions in a consecutive order as the wheel rotates 1/16 of a turn for each ribbon feed operation.

The motion produced by the camming lobes on the ribbon feed and lift wheel is transmitted to the lift control link by the ribbon lift control lever. The lift control lever is mounted to the front of the carrier by a shouldered screw and is spring loaded against the camming lobes of the feed and lift wheel.

During the early portion of a print cycle, the feed and lift wheel tends to rotate backwards with the feed pawl. This happens because the feed pawl is cammed out of the feed window as it travels toward the rear of the machine. To prevent the feed and lift wheel from rotating backwards, the ribbon lift control lever serves to detent the feed and lift wheel. This is accomplished by a detent notch cut on the high lobes of the ribbon feed and lift wheel.

The selected ribbon lift position for each print operation is always established by ribbon feed operation from the previous print cycle. This is because the rotation of the feed and lift wheel does not occur until after the typehead has printed.

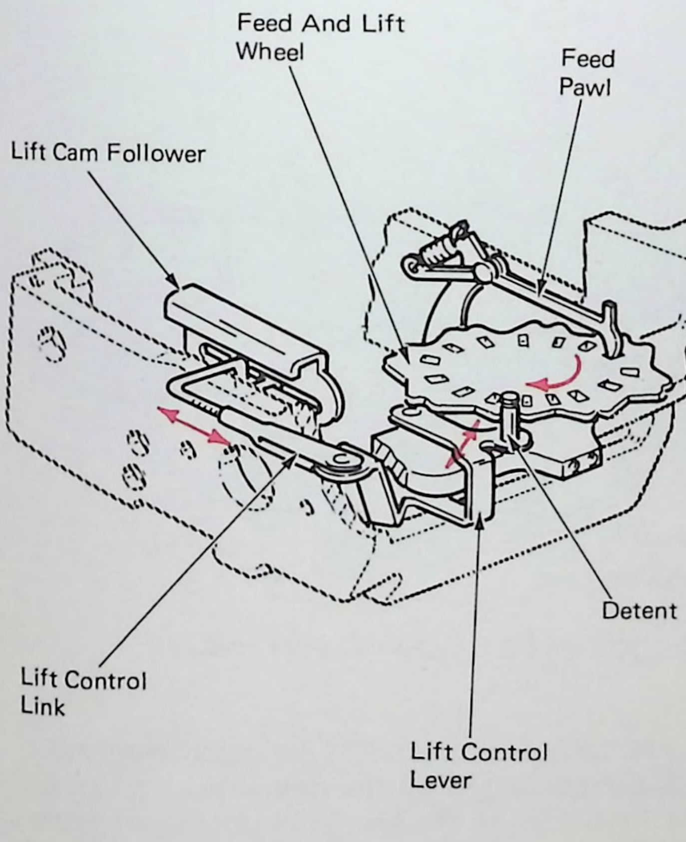
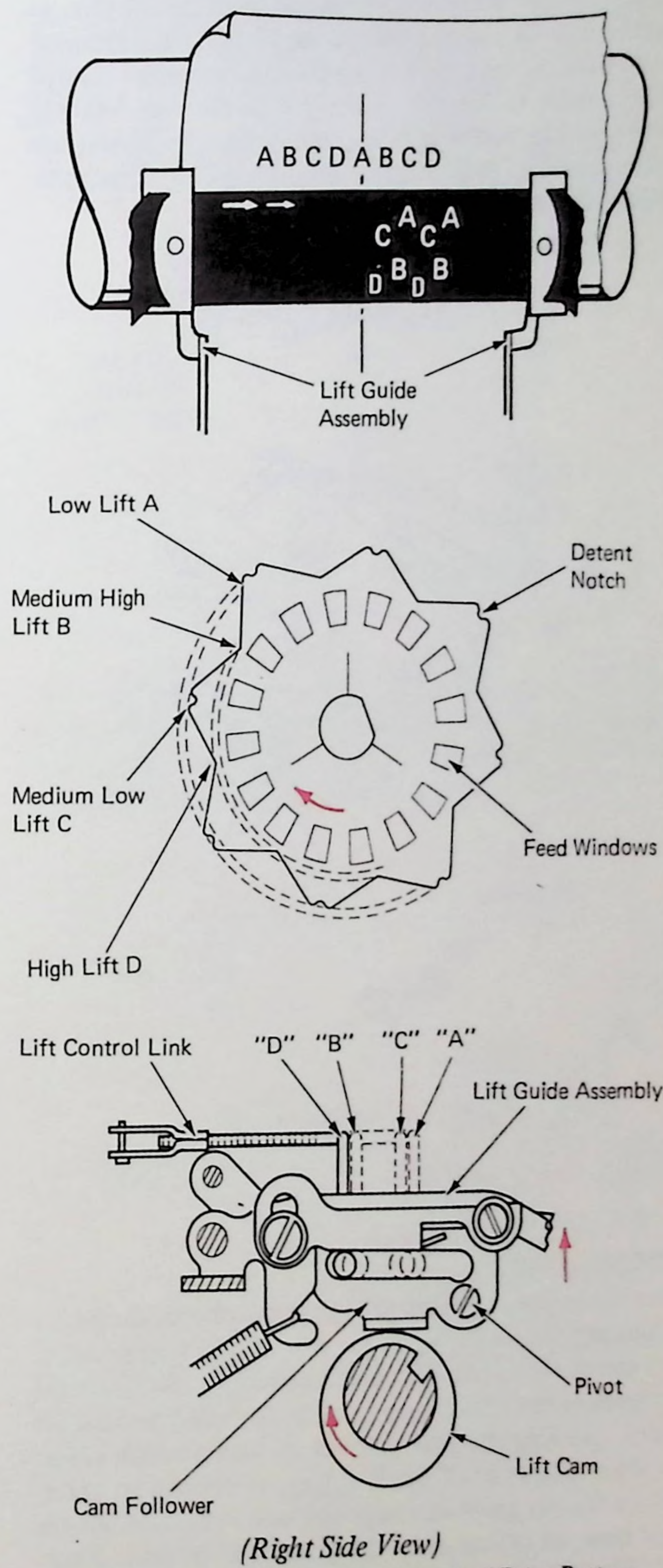


Figure 6 – Lift Control Lever

The four lift positions obtained by moving the control link are designated by "A", "B", "C" and "D" (Figure 7).

Positions "A" and "C" are low lift positions while "B" and "D" are high lift positions. These four lift positions occur in a definite order during a typing operation. It takes four print operations to complete a lift cycle, which is from "A" to "B" to "C" to "D". On the fifth print operation, the lift cycle begins all over again with lift position "A". Changing the location of the lift control link in the slot of the cam follower produces these lift positions.



(Right Side View)

Figure 7 – Ribbon Lift Positions And Print Pattern

STENCIL CONTROL

Whenever the machine is used for typing stencils, the ribbon feed and lift operation must be locked out. This is accomplished by pushing the stencil lever, located on the front of the carrier, to the rear (Figure 8).

The lockout of the feed mechanism is achieved through a lug on the stencil lever. In the stencil position, the lug pivots to the right into the path of the upright lug of the feed pawl. Ribbon feed is interrupted because the feed pawl is not allowed to move to the rear and drop into the next feed window.

Lockout of the lift operation is achieved by a camming surface on the left end of the stencil lever. As the lever is pushed into the stencil position, the lift control is cammed away from the feed and lift wheel. This causes the control link to move to the rear of the slot in the cam follower where no lift motion will be produced to the ribbon lift guide assembly. The stencil lever must be pulled forward to restore ribbon feed and lift.

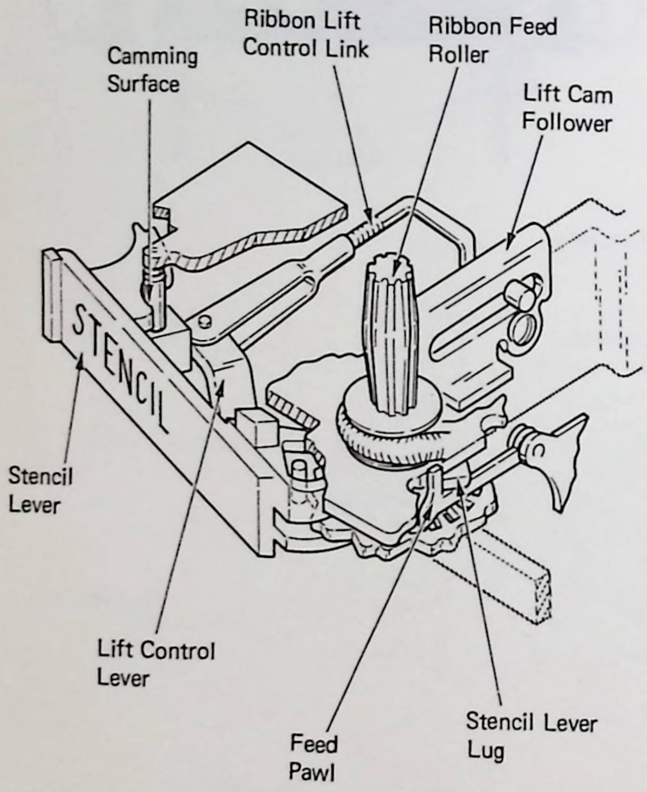


Figure 8 – Stencil Lockout

RIBBON LOAD

When the operator desires to change the ribbon, she begins by pushing the load lever to the rear into its load position. This causes the ribbon lift guide assembly to rise above the typehead so the ribbon may be easily threaded through the guides. Latching the load lever in its load position causes the lower extension of the load lever to contact an extension on the lift guide assembly and cam it upward. At the same time, an extension on the pressure roller lever is contacted by the upper portion of the load lever and pivots the pressure roller away from the feed roller. The operator may now install a ribbon with no obstructions (Figure 9).

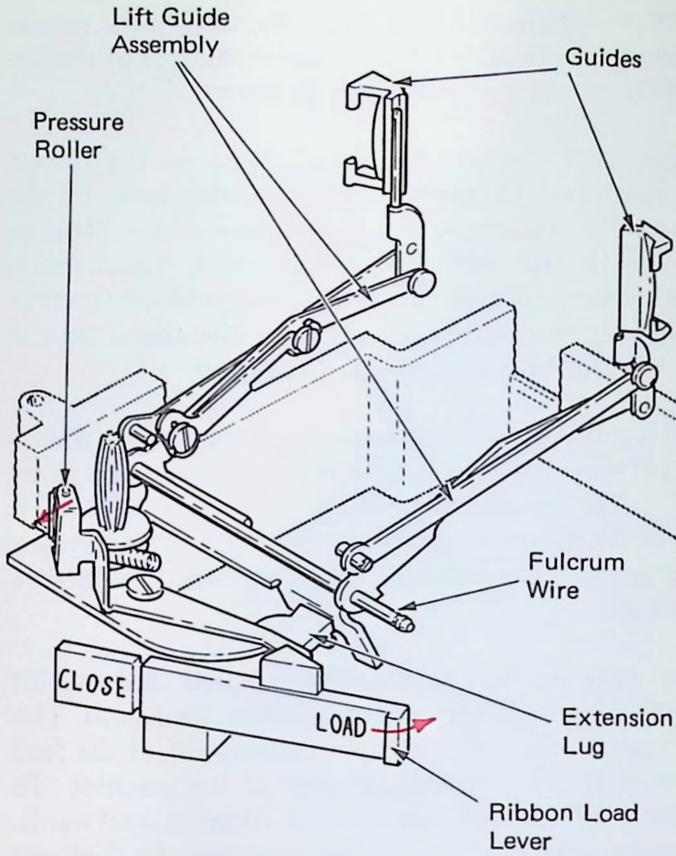


Figure 9 – Ribbon Load Position

LEVEL 1 DIFFERENCES

The Level 1 film ribbon mechanism differs slightly from the mechanism just described. A supply drag lever is in contact with the ribbon on the supply spool (Figure 10).

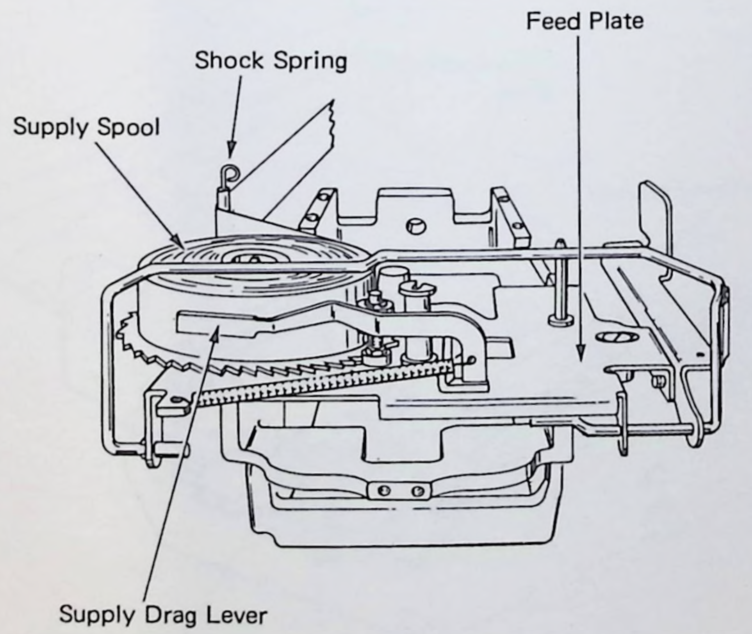


Figure 10 – Supply Drag (Level 1)

During a feed operation (Figure 11) the supply spool brake is mechanically disengaged by the ribbon lift mechanism. The upper extension of the lift guide plate contacts the brake actuating lever when the lift guide is in the raised position. As the brake actuating lever pivots about its pivot point, it cams the supply spool brake out of engagement with the supply spool.

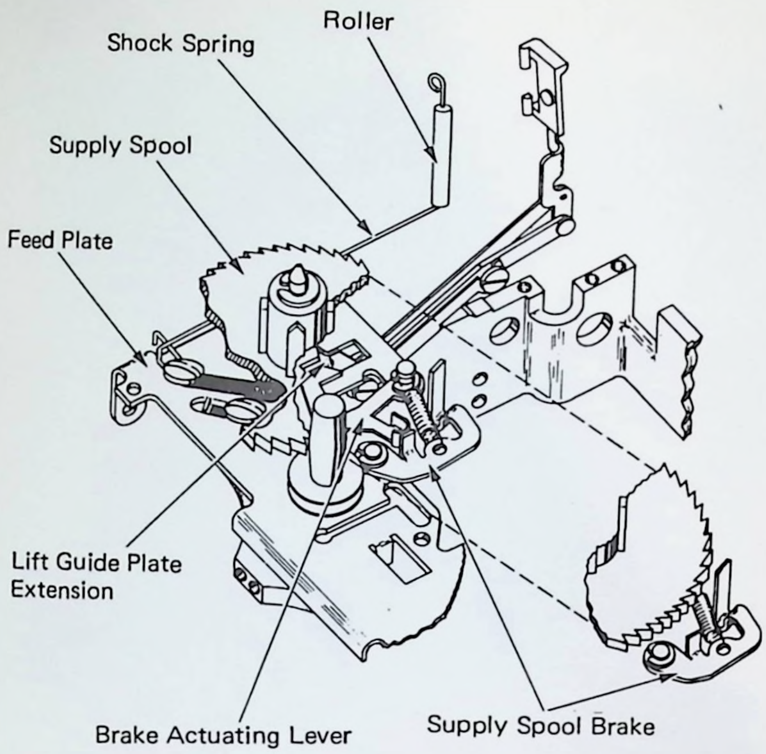


Figure 11 – Ribbon Shock Spring And Brake Actuating Lever

To prevent the ribbon feed and lift wheel from rotating backward during a feed operation, a detent spring rides in the feed windows of the ribbon feed and lift wheel (Figure 12).

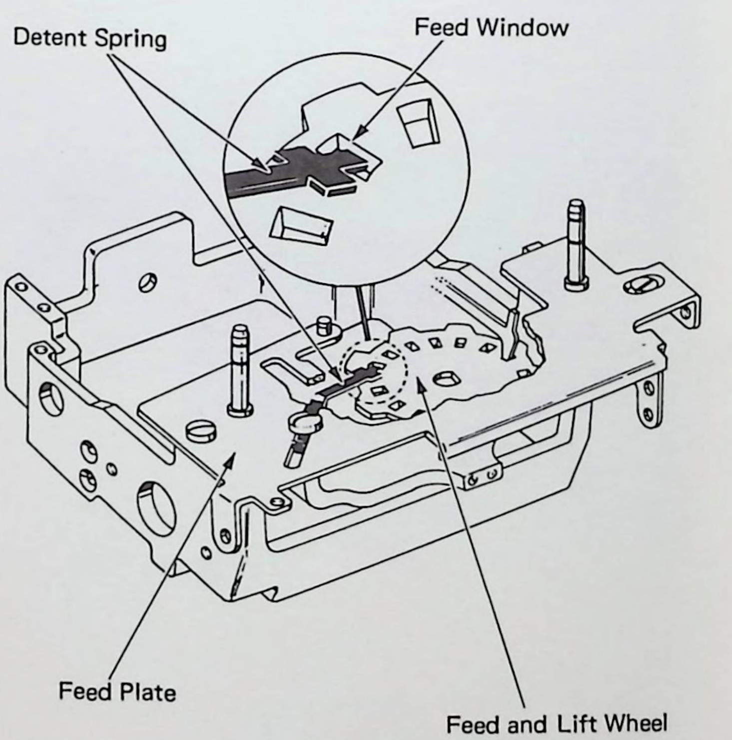


Figure 12 – Feed & Lift Wheel Detent Spring (Level 1)

In the stencil position (Figure 13), a shield is rotated beneath the feed pawl to prevent the feed pawl from operating in the feed windows. Lockout of the lift mechanism is achieved in the same manner as the present mechanism. However, the parts design is slightly different.

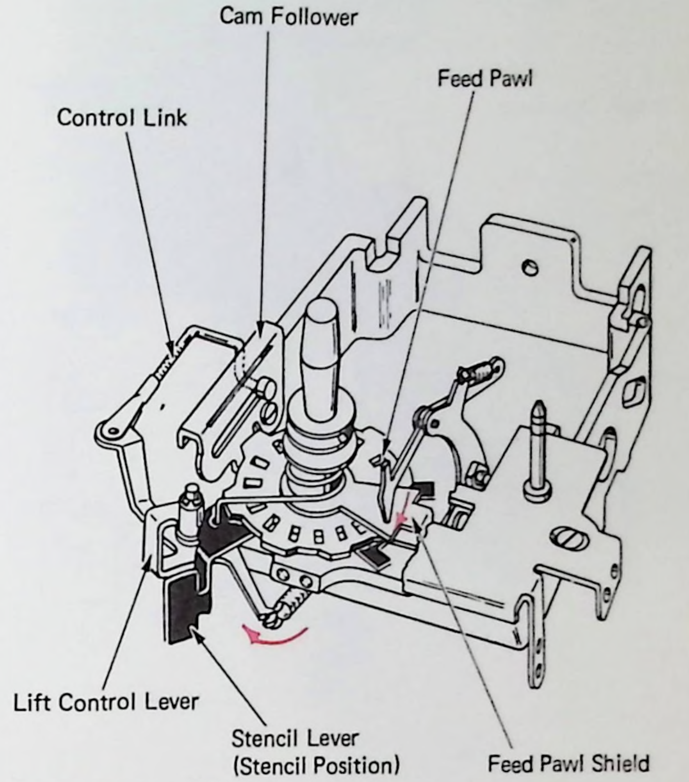


Figure 13 – Stencil Lockout (Level 1)

The ribbon load operation is initiated by a ribbon load bail (Figure 14). A link is connected between the ribbon load bail and the load lever. The load lever raises the lift guide assembly in the same manner as the current load lever.

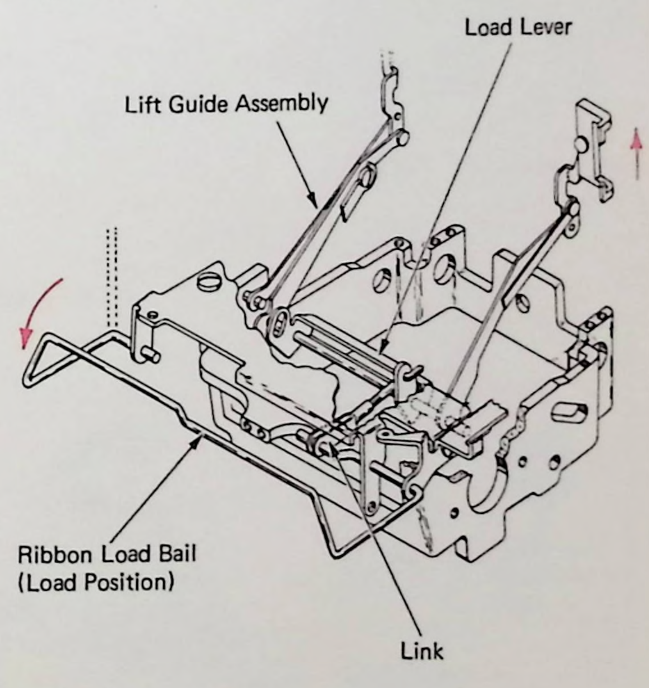


Figure 14 – Ribbon Load Operation (Level 1)

An adjustable pressure roller release arm is attached to the load lever to release the pressure roller in the load position (Figure 15). The pressure roller release arm pushes against the pressure roller lever. As the pressure roller lever pivots away from the feed roller, it also cams the supply drag lever away from the supply spool. Thus, all obstructions are removed to permit the operator to install a new ribbon.

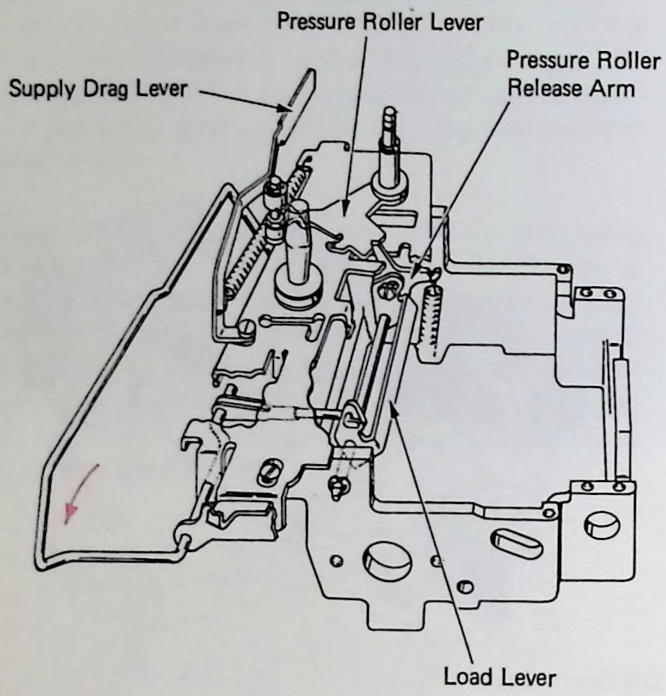
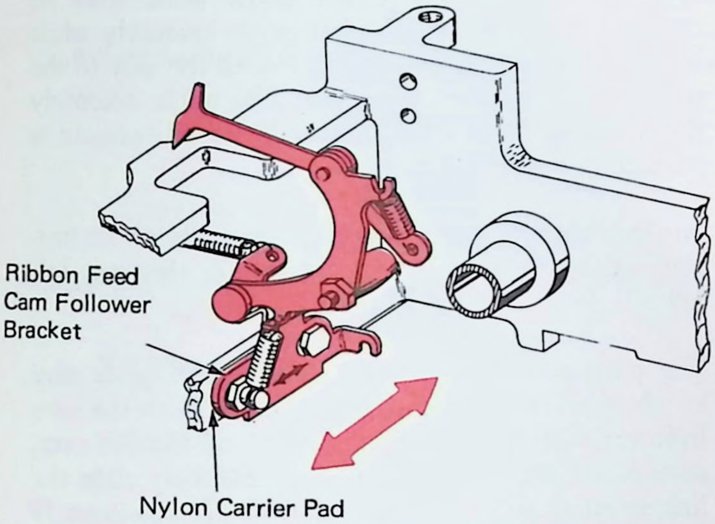


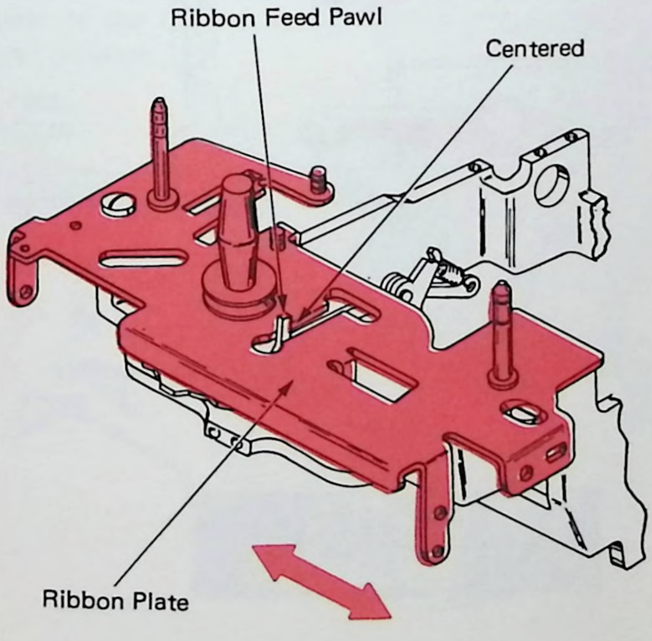
Figure 15 – Pressure Roller Release (Level 1)

1. *Ribbon Feed Cam Follower Bracket* – With the nylon carrier pad against the carrier casting, the ribbon feed cam follower bracket should be centered left to right in its mounting hole. Keep the bottom of the bracket parallel to the carrier pad.



(Right Rear View)

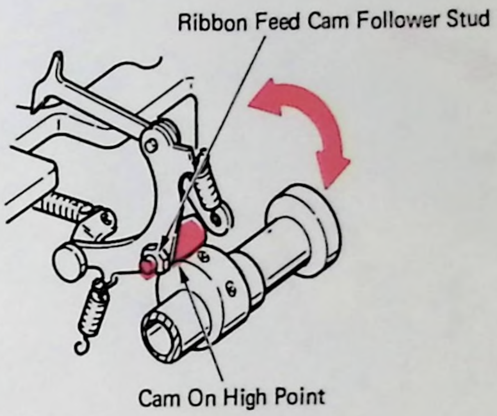
2. *Ribbon Plate* – Adjust the ribbon plate left to right so the ribbon feed pawl is centered in the operating slot. The ribbon feed pawl must move freely front to rear in its slot.

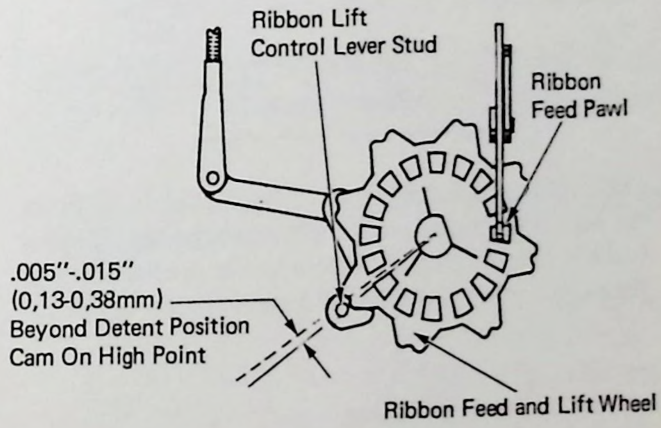


(Top View)

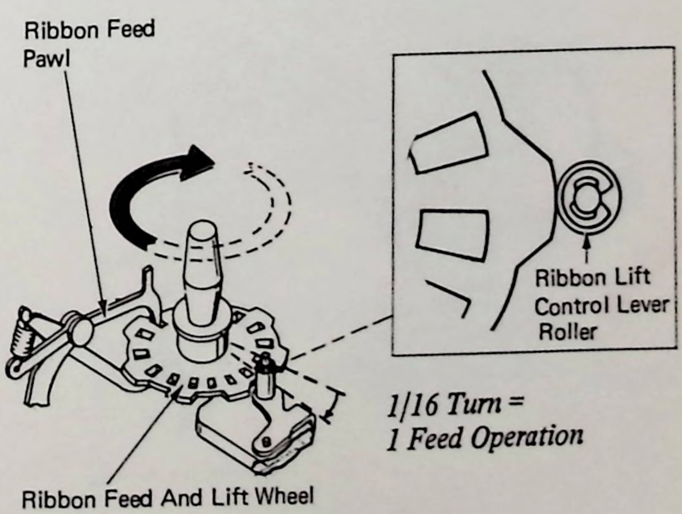
3. *Ribbon Feed Cam Follower Stud (Level 2)* – Hand cycle the machine and observe the lift control lever stud as it moves from the low point to the high point on the ribbon feed and lift wheel. Adjust the ribbon feed cam follower eccentric stud so the ribbon lift control lever stud overthrows the detent notch in the ribbon feed and lift wheel by .005"-.015".

(Level 1) – Machines not equipped with the detented positions on the ribbon feed and lift wheel should be adjusted so the lift control lever roller is centered on the high dwell of the ribbon feed and lift wheel.



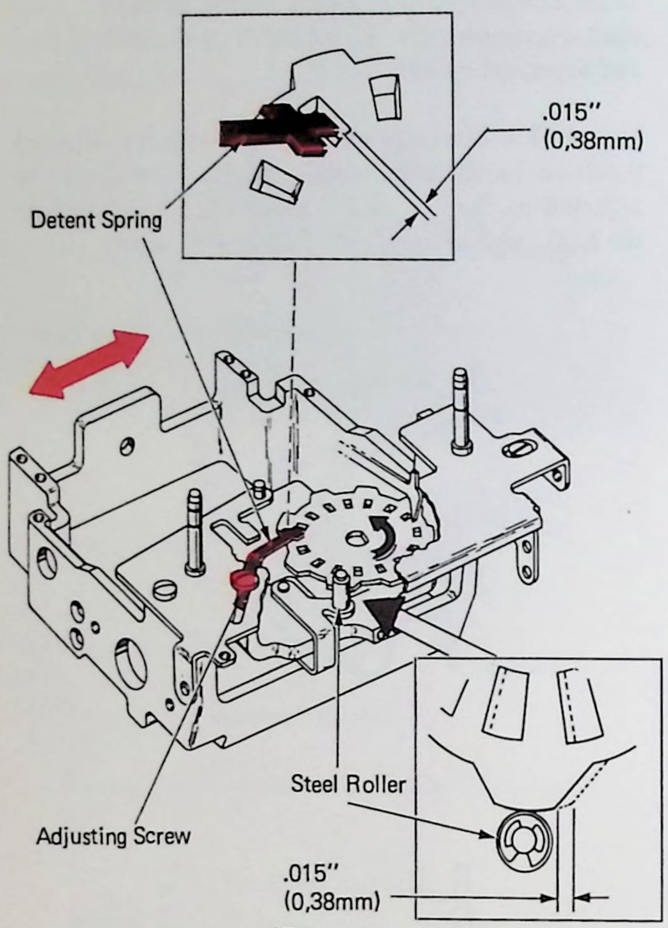


(Level 2 – Top View)



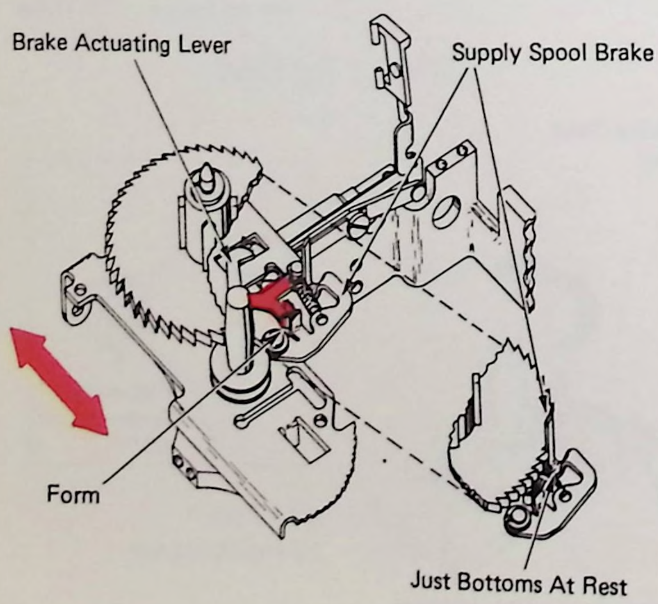
(Level 1 – Top View)

4. *Ribbon Feed and Lift Wheel Detent Spring (Level 1 Only)* – Hand cycle the machine and observe the ribbon feed and lift wheel detent spring as the ribbon lift control lever roller moves from the low point to the high point on the ribbon feed and lift wheel. The ribbon feed and lift wheel should travel .015" after the detent spring drops into a feed window.



(Front View)

5. *Brake Actuating Lever (Level 1 Machines Only)* – Form the lug on the brake actuating lever so the supply spool brake is allowed to just bottom in the ratchet teeth of the supply spool when the machine is at rest.



(Front Rear View)

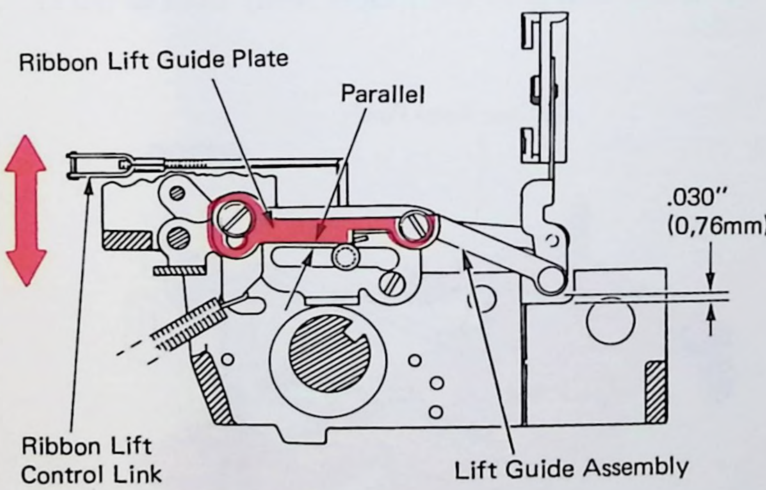
6. *Ribbon Lift Guide Plate* – With the ribbon lift cam follower on the low point of the ribbon lift cam, position the lift guide plate on the arm of the lift guide assembly to satisfy the following conditions:

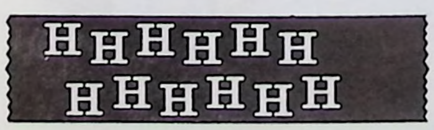
   a. Position the lift guide plate vertically so the rear of the lift guide assembly rests .030" above the carrier casting when the stencil lever is not in the stencil position.

      The verticalness of the lift guide plate may be checked by observing the lift guide assembly while manually pushing the control link all the way to the rear into its stencil position. The guide assembly should drop .030" at the rear if the adjustment is correct.

   b. Position the lift guide plate horizontally so its bottom surface is parallel to the slot in the cam follower.

      The parallel adjustment of the lift guide plate may be checked in the following manner. With the cam follower resting on the low point of the lift cam, disconnect the control link and manually slide the link front to rear through the four lift positions. If the plate is parallel, no movement will be produced to the ribbon lift guide assembly while sliding the link back and forth. Do not slide the link into the stencil position while making this check.



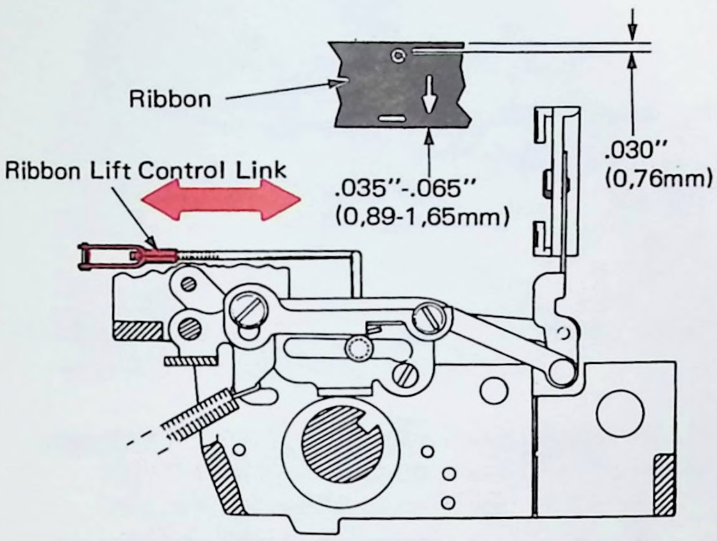


(Right Side View)

7. *Lift Control Link* – Adjust the clevis on the ribbon lift control link so the lowest underscore prints .035"-.065" from the bottom edge of the ribbon. The "degree" character should be at least .030" from the top of the ribbon.

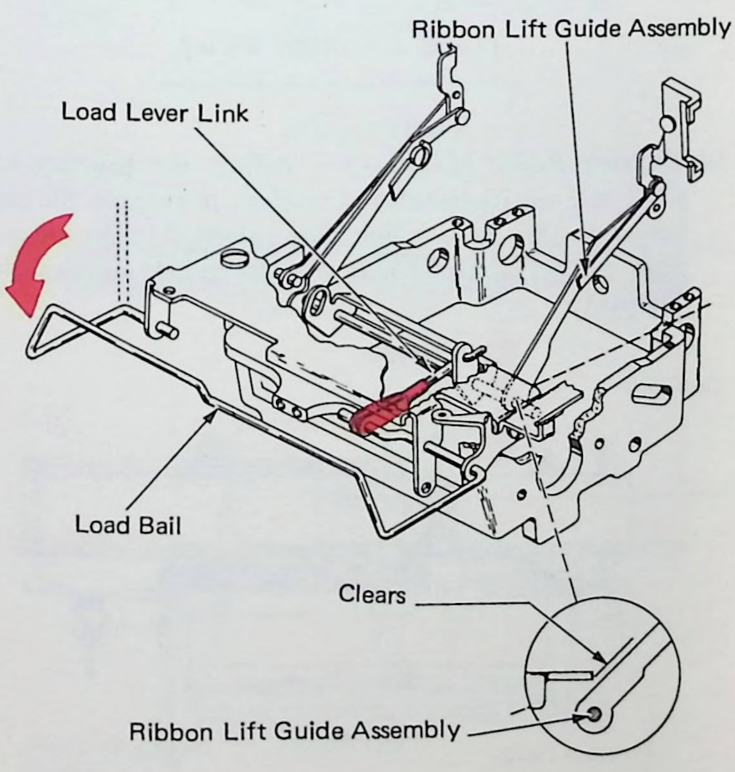
NOTE: The adjustment of the ribbon lift control link positions the lift pattern on the ribbon and does not have any effect on the distance or spread between each of the four lift positions in the pattern.

Adjustments 8 through 14 are for level 1 mechanisms only.



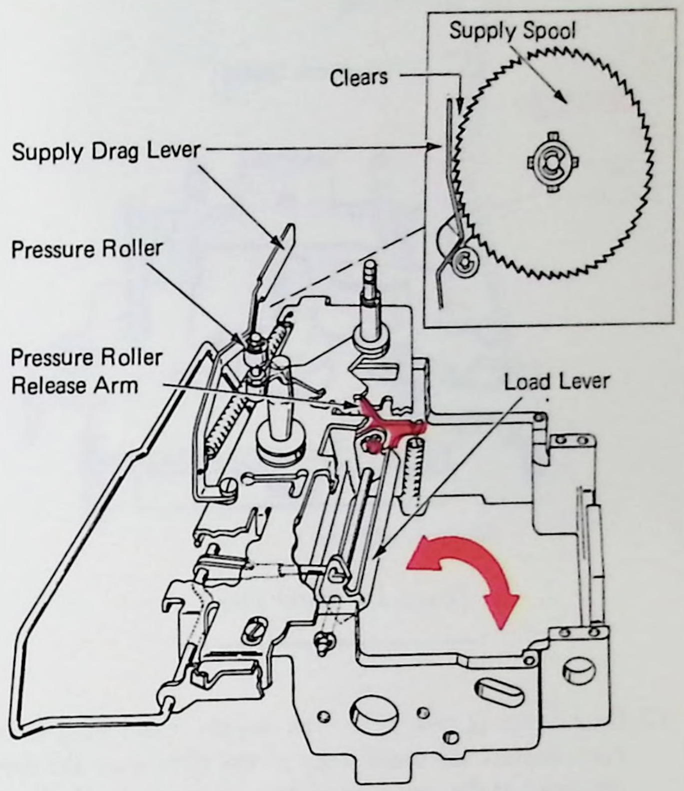
(Right Side View)

8. *Load Lever Link (Level 1 Only)* – Adjust the load lever link to raise the ribbon lift guide assembly as high as possible without binding off on either the ribbon feed plate or the take-up spool when the load bail is in the load position.



(Level 1 – Right Side View)

9. *Pressure Roller Release Arm (Level 1)* – Adjust the pressure roller release arm beneath its binding screw, located on the left end of the load lever, so the supply drag lever will be pushed forward by the pressure roller to just clear the front edge of the supply spool.

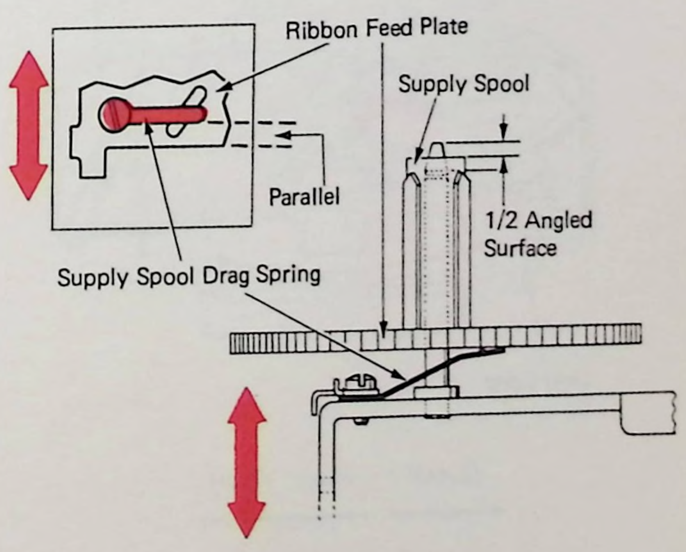


(Level 1)

10. *Supply Spool Drag Spring (Level 1)* – Adjust the supply spool drag spring to satisfy the following conditions:

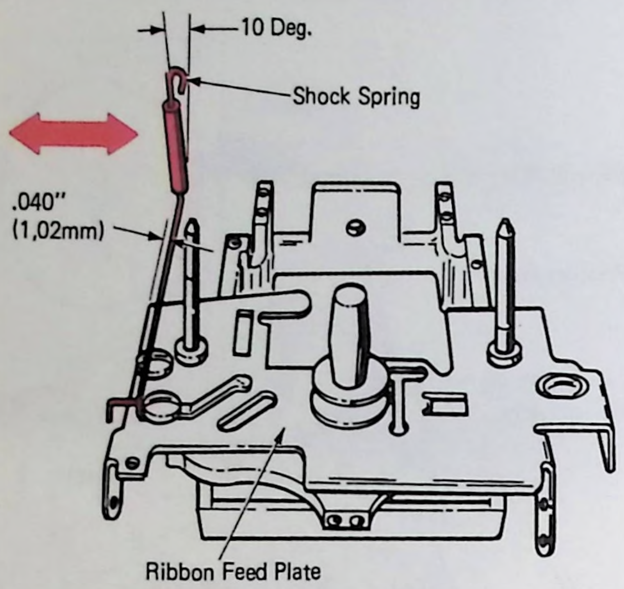
   a. Position the drag spring parallel to the front edge of the ribbon feed plate.

   b. With the "C" clip removed, the drag spring should raise the supply spool so half of the angled surface on top of the pivot stud is protruding above the top face of the spool. Form the drag spring up or down to obtain this condition.



(Level 1 – Front View)

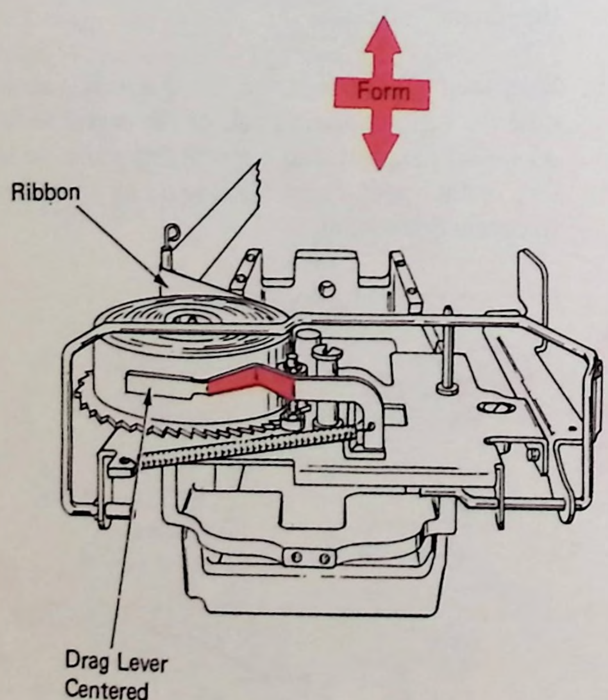
11. *Shock Spring (Level 1)* – Position the shock spring so it is approximately .040" to the right and parallel to the edge of the ribbon feed plate. The shock spring should be formed to make the roller on the shock spring lean 10 deg. to the left.



(Level 1 – Front View)

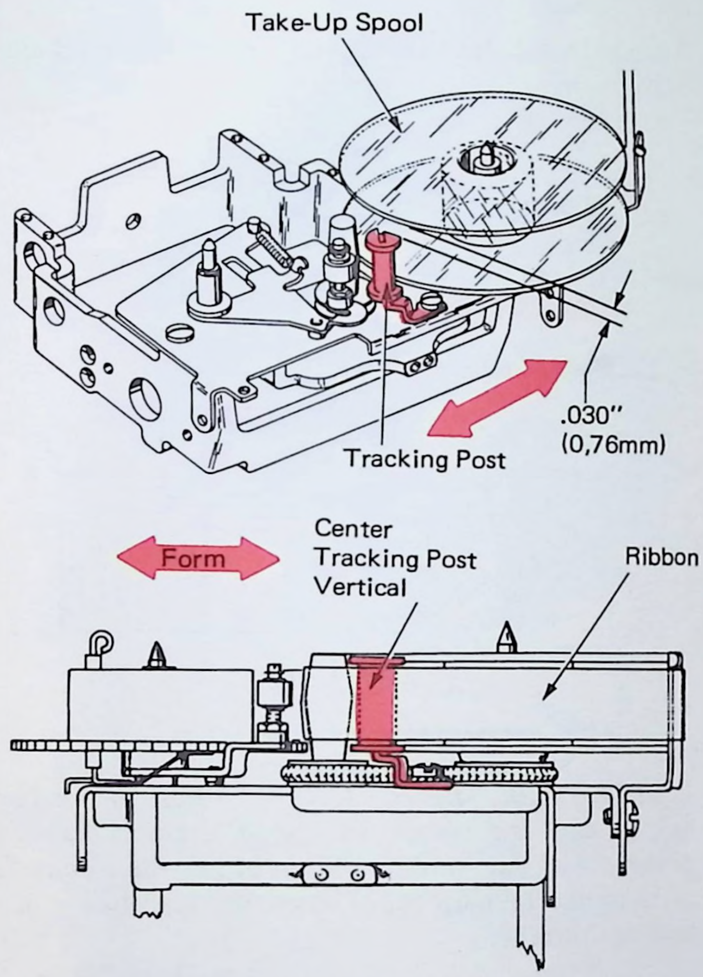
12. *Drag Lever (Level 1)* – The supply spool drag lever must contact the outer wrap of the ribbon on the supply spool at the center or slightly above. Form the lever to obtain this condition. Do not form it front to rear.

NOTE: After forming the lever make sure that it does not bind on its pivot screw. If the supply spool drag lever contacts the ribbon below center, the outer wraps of the ribbon spool will tend to creep up which may cause ribbon spillage



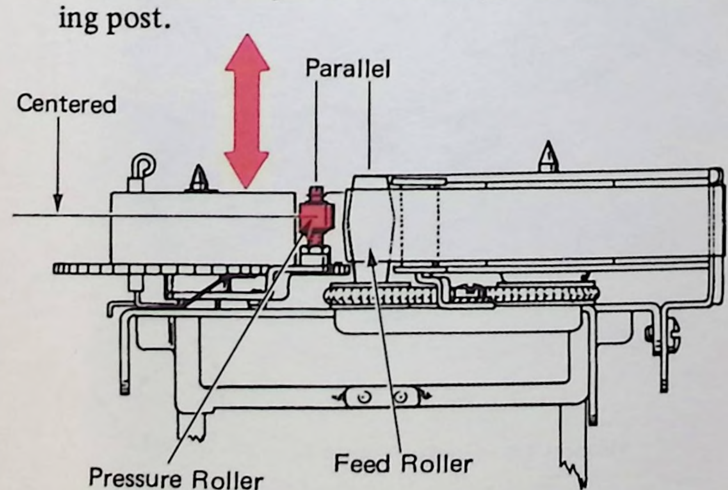
(Level 1 – Front View)

13. *Tracking Post (Level 1)* – Position the tracking post under its mounting screw so it clears the flanges of the transparent take-up spool by .030". Form the tracking post at the bottom so the tracking post is vertical to the feed plate. If the tracking post is vertical, the ribbon will be centered as it passes between the two flanges of the transparent take-up spool. It should also track on the center of the feed roller and evenly between the two flanges of the tracking post without touching either flange.



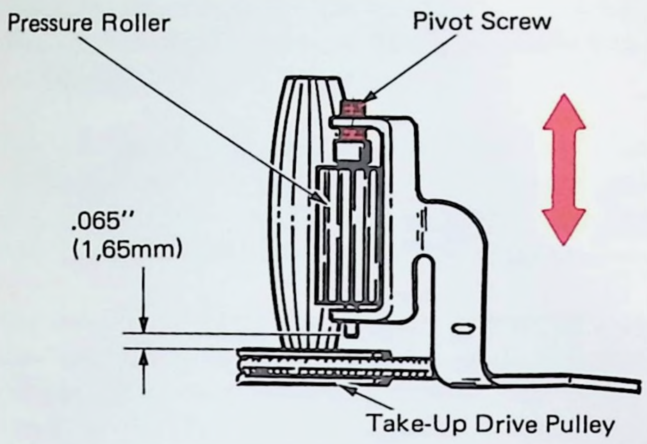
(Level 1 – Front View)

14. *Pressure Roller (Level 1)* – Adjust the pressure roller vertically on its mounting stud so it engages the center crown on the feed roller. The pressure roller mounting stud should be parallel to the previously aligned tracking post.



(Level 1 – Front View)

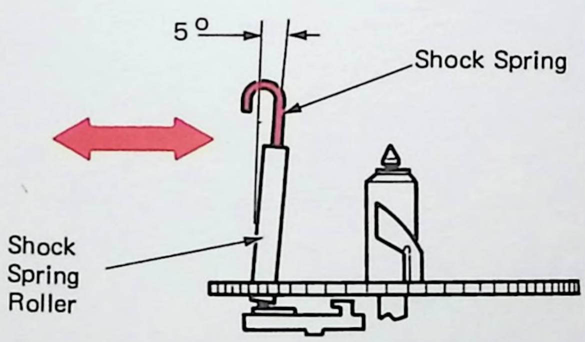
15. *Pressure Roller (Level 2 Only)* – Machines with the adjustable geared pressure roller should be adjusted so the lower end of the pivot screw clears the take-up drive pulley by .065".



(Left Side View)

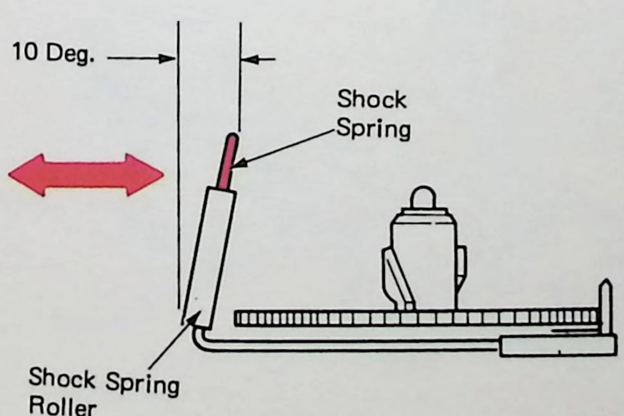
16. *Shock Spring (Level 2 Only)* – Form the shock spring to satisfy the following conditions:

   a. When viewed from the front of the machine, the shock spring should be formed to make the roller on the shock spring lean 5 deg. to the right.



(Front View)

   b. When viewed from the side, the shock spring should be formed so the roller leans to the front 10 deg.



(Left Side View)

RED RIBBON SHIFT OPERATIONAL THEORY

"Selectric" I/O Typewriters equipped with the red ribbon shift feature (Figure 1) can be shifted from the low lift (black) ribbon position to the high lift (red) ribbon position from a remote source. There are two versions of this option: a one magnet ribbon shift mechanism and a two magnet ribbon shift mechanism.

The red ribbon shift mechanism is not controlled from the "Selectric" I/O keyboard. The mechanism must be operated from some remote source which is programmed to shift from the black to the red ribbon mode.

The red ribbon shift mechanism consists of magnets, and a tape and pulley system which connects the magnets to the ribbon lift mechanism in the carrier. The ribbon lift mechanism is modified to include a cam follower latch which causes the ribbon lift mechanism to switch from the low lift, or black mode, to the high lift, or red mode (Figure 1).

Because the cam follower is a part of the moveable carrier and the magnets are in a fixed position on the frame, a tape and pulley system is used to operate the mechanism. One end of the tape is fixed to the right side of the carrier; it is then routed around an adjustable R.H. pulley, a fixed L.H. pulley, and a pulley on the end of the magnet armature. The opposite end of the tape is attached to the spring loaded cam follower latch which maintains tape tension. This system allows free movement of the carrier without affecting the red ribbon shift mechanism.

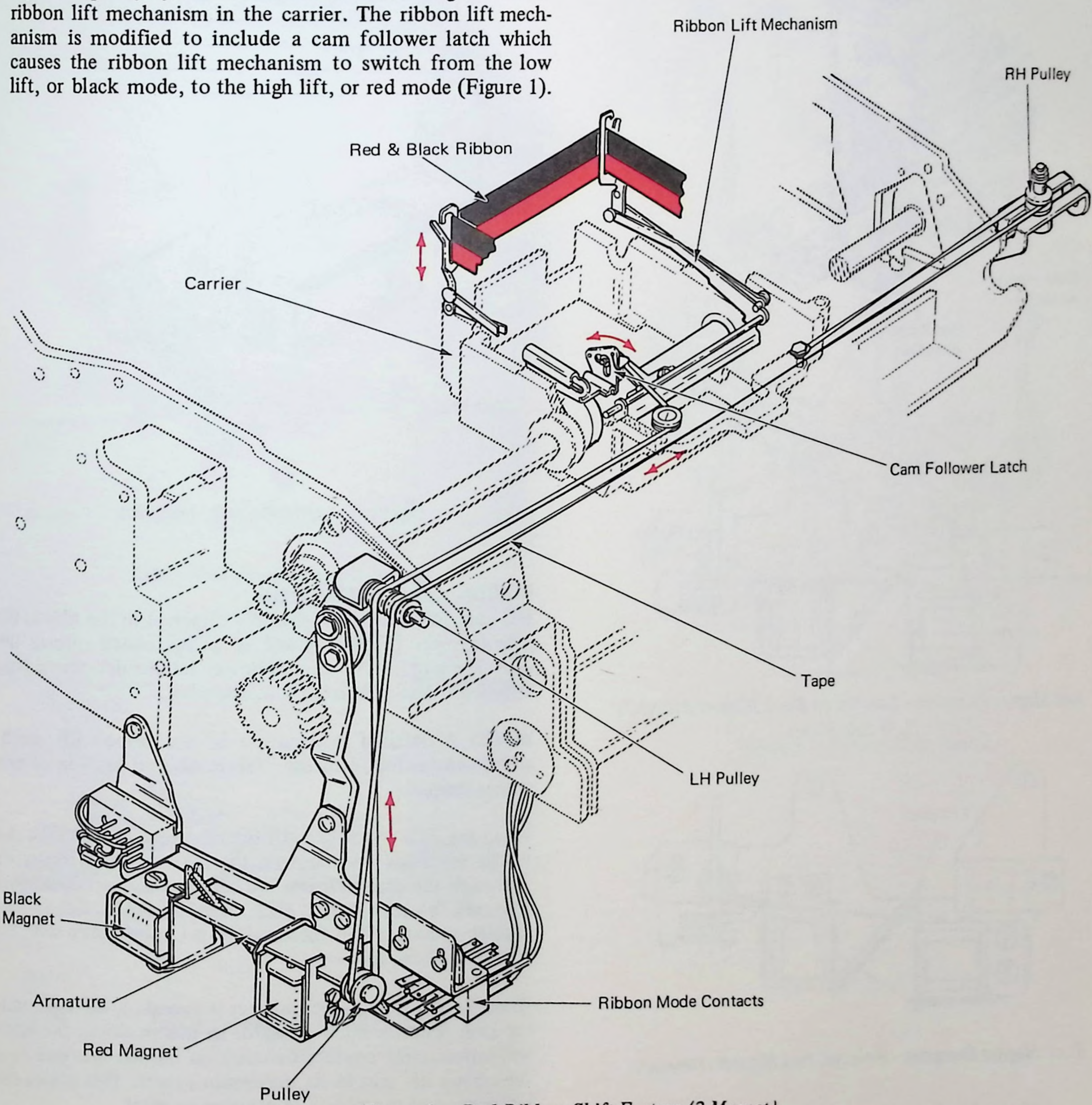
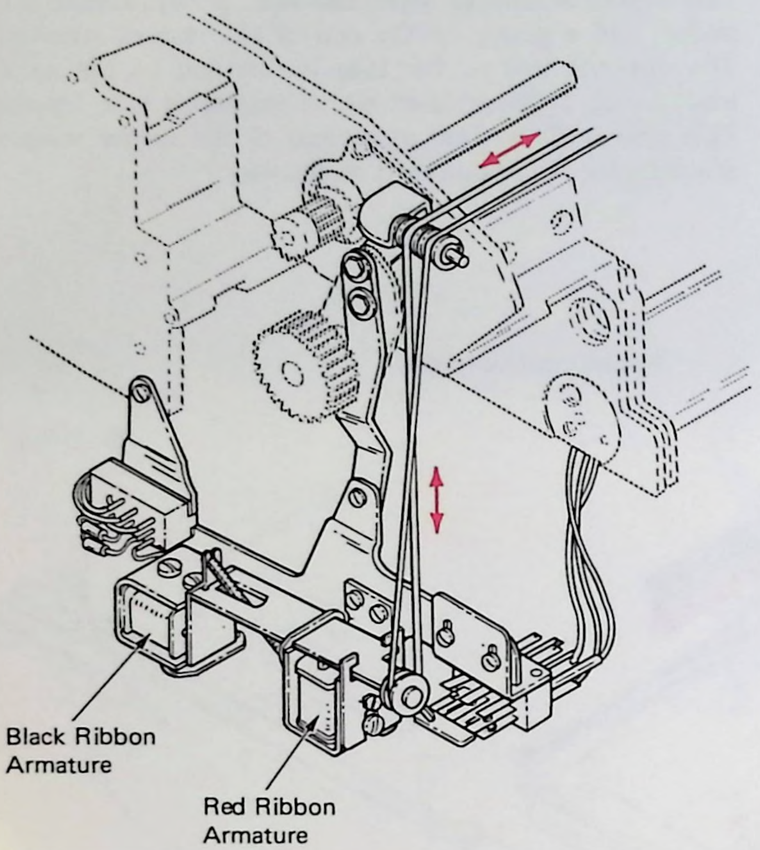
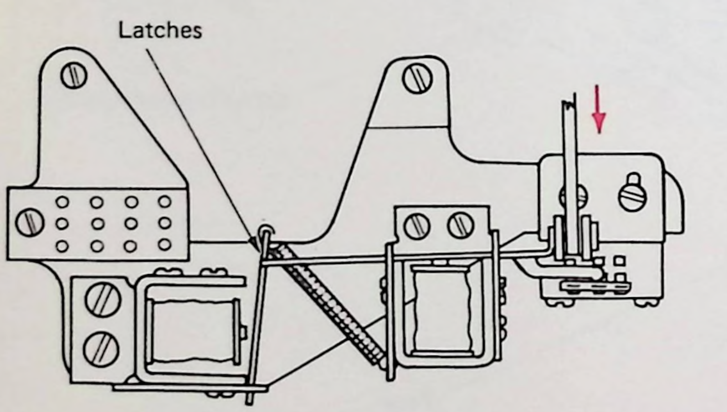


Figure 1 – Red Ribbon Shift Feature (2 Magnet)

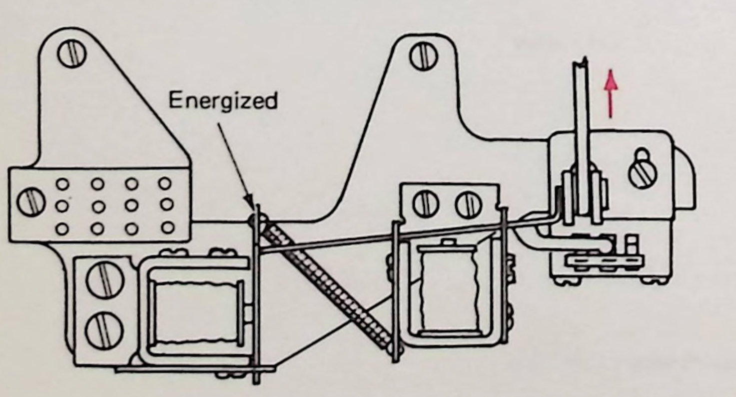
MAGNET OPERATION

When the red ribbon magnet armature is attracted with the black ribbon magnet de-energized, the black ribbon armature latches beneath the red ribbon armature holding the red ribbon armature in the energized position (Figure 2).





Red Magnet Energizes – Latches on Black Magnet Armature (Left Side View)



Black Magnet Energizes – Releases Red Magnet Armature

Figure 2 – Magnets Operation (Left Side View)

Attracting the black ribbon magnet armature allows the red ribbon armature to return to its de-energized position.

The red and black mode magnets are intermittently energized. Each magnet is energized only for sufficient durations to allow for latching or unlatching of their respective armatures.

The one magnet ribbon shift mechanism contains a continuous duty magnet and is limited to an occasional printout in the red mode. The ribbon will remain in the red mode only as long as the magnet is energized (Figure 3).

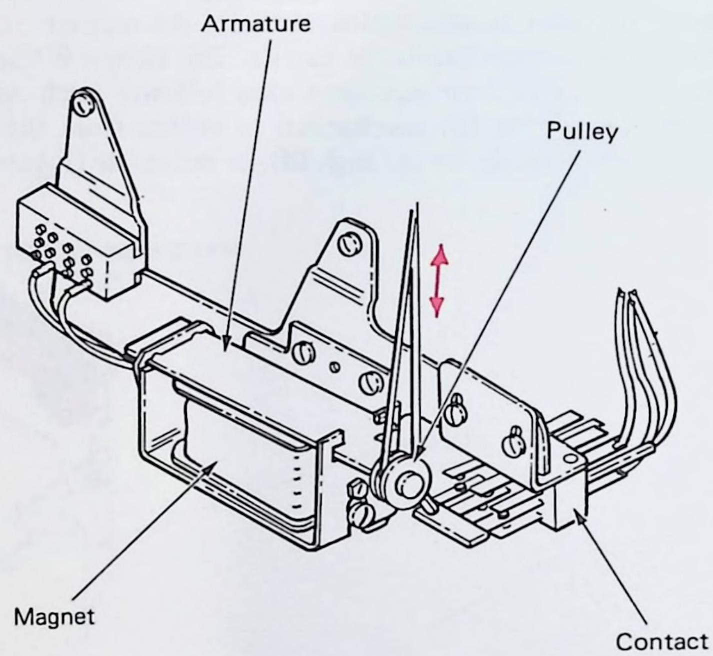


Figure 3 – One Magnet Assembly

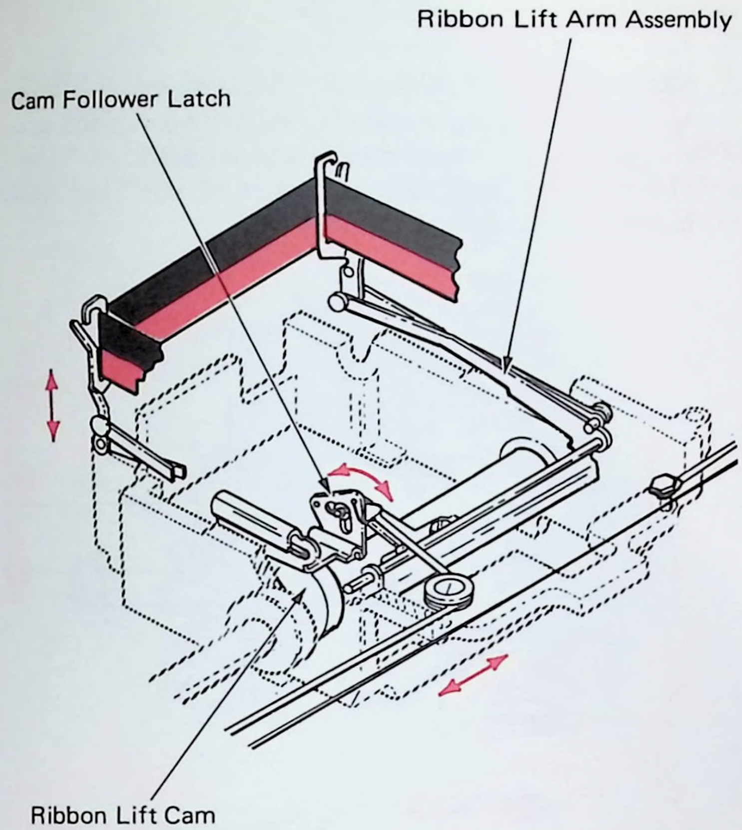
RIBBON LIFT OPERATION

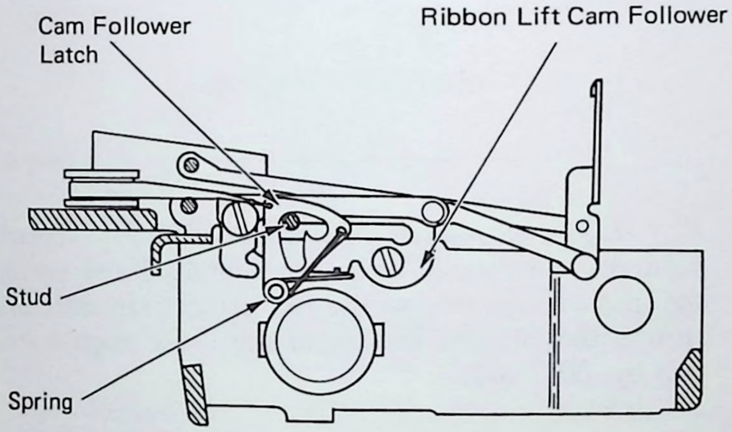
The cam follower latch is solidly attached to the ribbon lift cam follower (Figure 4) and is spring loaded toward the rear. The slot of the cam follower latch rides over a stud attached to the ribbon lift arm assembly.

NOTE: A detailed explanation of the ribbon lift mechanism can be found in the "fabric ribbon" section of this service manual.

When the cam follower latch is to the rear, (at rest) the slot in the latch has no affect on the lift arm stud (Figure 4). Although the cam follower latch moves up and down with the cam follower during each print cycle, its slot is long enough to ensure that there will be no interference with the ribbon lift arm stud.

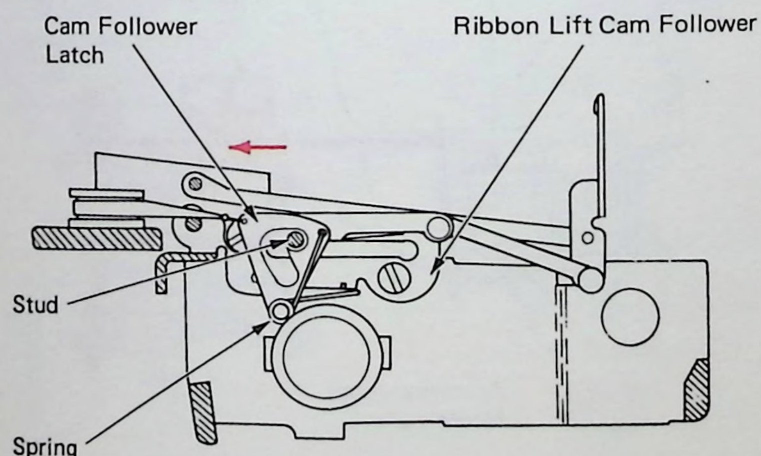
When the red ribbon shift magnet is operated, the tape pulls the cam follower latch forward. In this position, the latch will immediately contact the stud on the lift arm and raise the ribbon lift arm to its maximum height. This places the red portion of the ribbon in position to print.





Latch Position For Black Ribbon

(Right Side View)



Latch Position For Red Ribbon

(Right Side View)

Figure 4 – Ribbon Positions

RIBBON MODE CONTACTS

Both the one and two magnet mechanisms utilize contacts to provide an electrical indication of the ribbon mode (Figure 5).

The ribbon mode contacts are operated by an extension of the red ribbon armature. The armature strikes an insulated actuating surface of the contact operating strap. When the armature is in the de-energized position, the N/C contacts will be closed. When the armature is attracted, the N/O contacts will be closed, indicating the ribbon is in the red position.

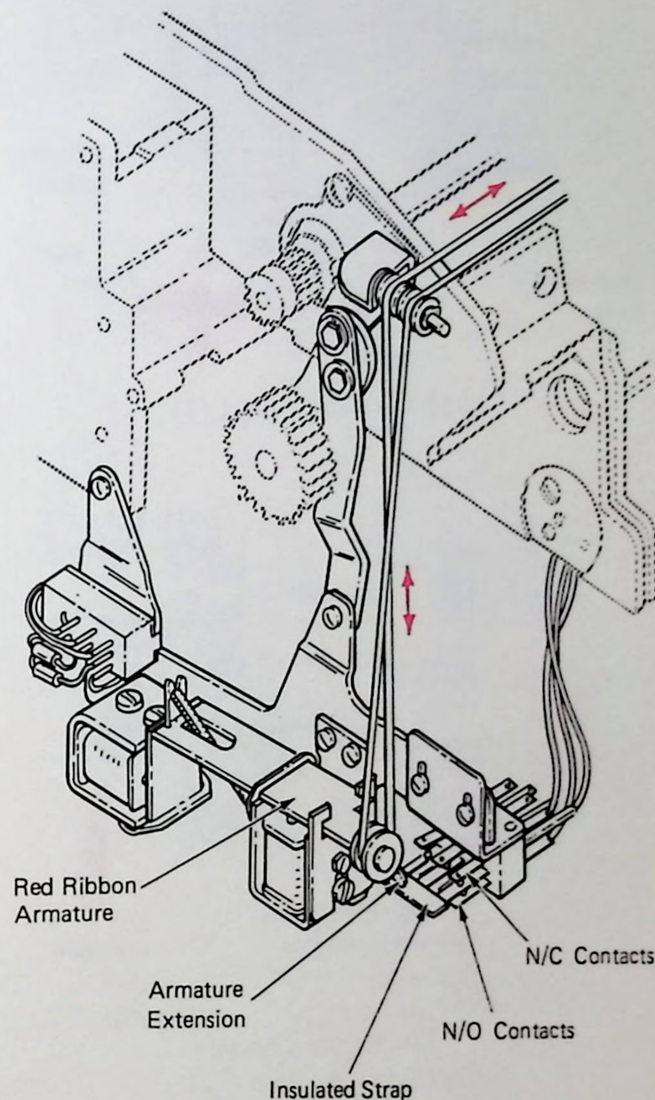
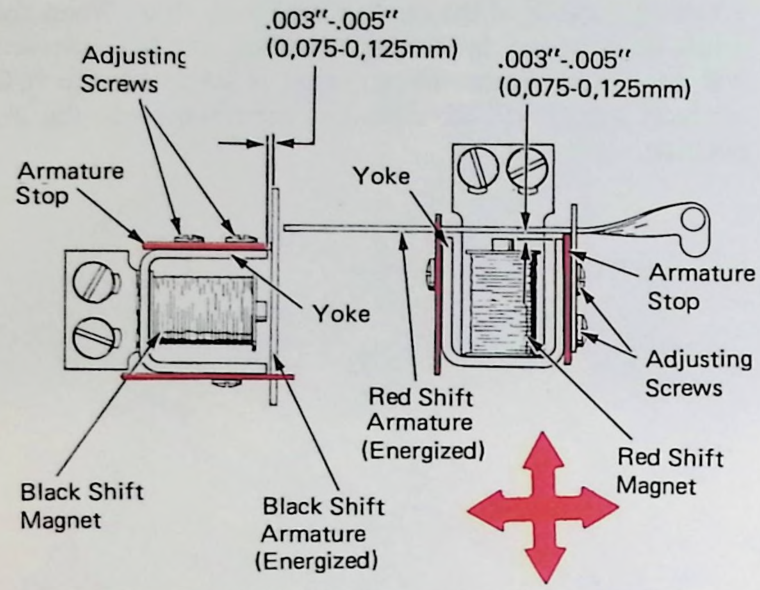
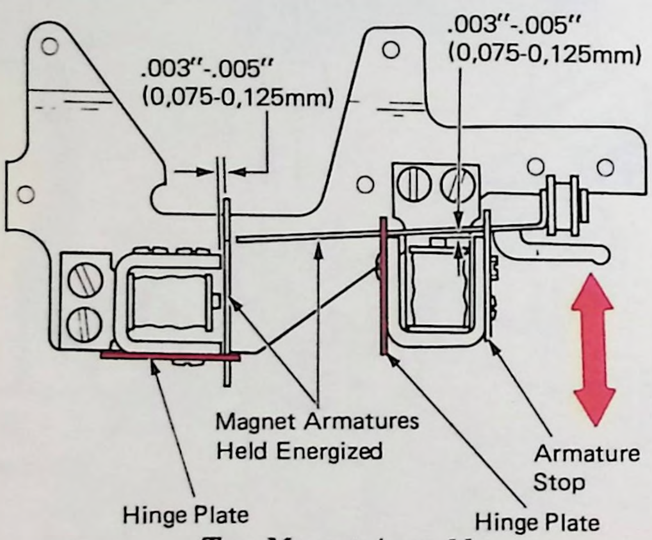


Figure 5 – Ribbon Mode Switch

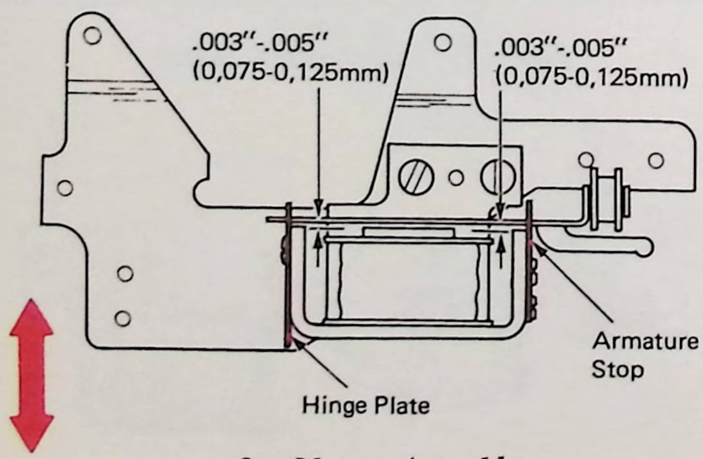
1. *Magnet Armature Hinge Plates* – With the magnet armatures held manually energized, position the hinge plates and the armature stops so a clearance of .003"-.005" exists between the armatures and the magnet yokes.



(Left Side View – Level 1)

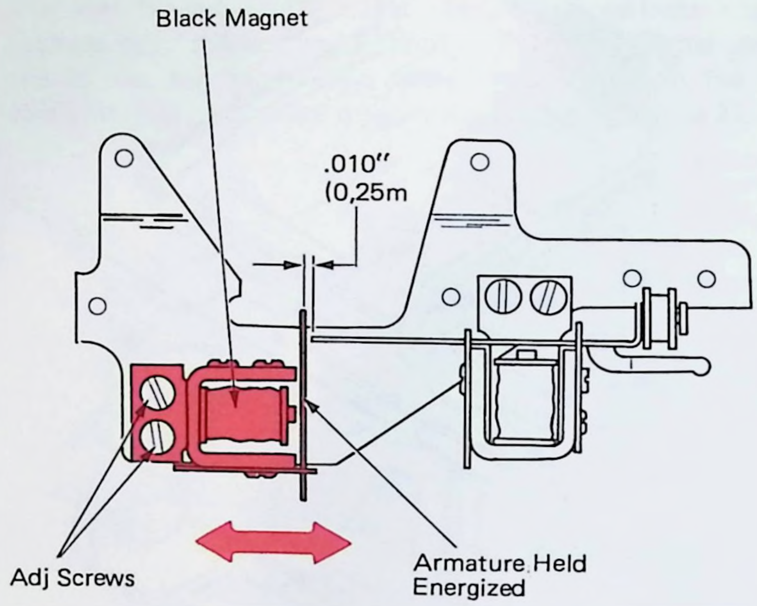


Two Magnet Assembly
(Left Side View – Level 2)



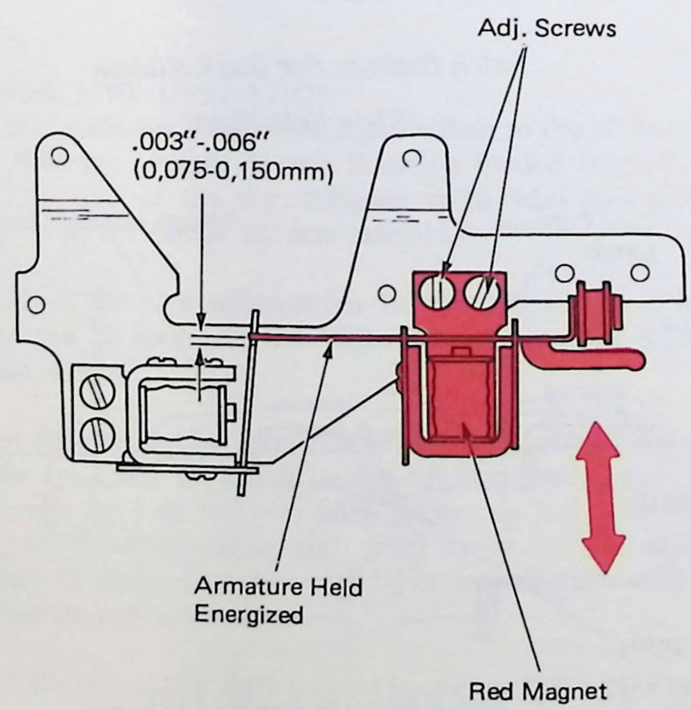
One Magnet Assembly
(Left Side View – Level 2)

2. *Black Magnet (2 Magnet Mechanism Only)* – With the black shift magnet armature manually energized and the red shift magnet armature de-energized, position the black shift magnet for a clearance of .010" between the black and red shift armatures.



(Left Side View)

3. *Red Magnet (2 Magnet Mechanism Only)* – Manually hold the red magnet armature energized and position the magnet assembly so the red magnet armature overthrows the latching surface of the black magnet armature by .003"-.006".

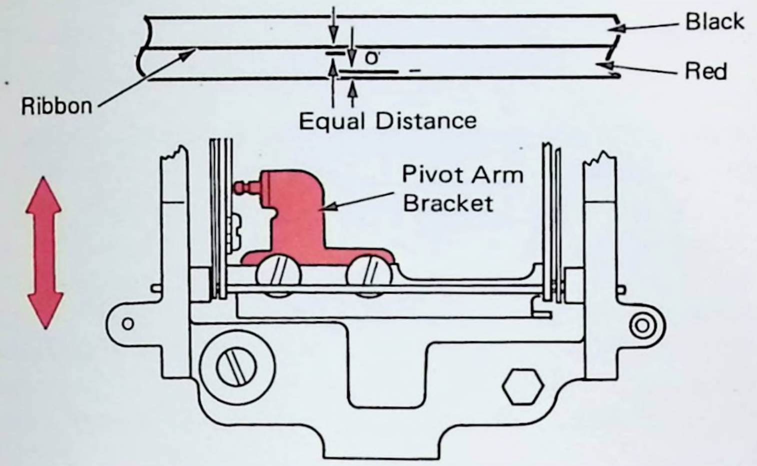


(Left Side View)

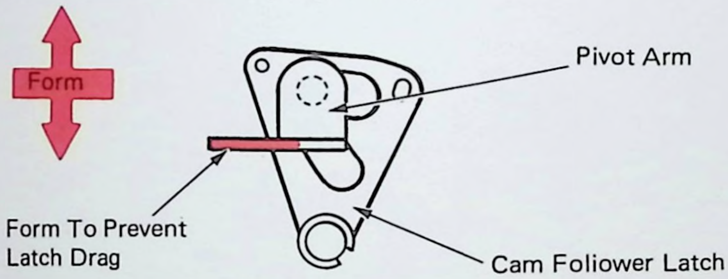
4. *Pivot Arm* –

   a. With the manual ribbon lift lever in the black position, form the pivot arm bracket (up or down) so that the latch does not drag when moved from the latched to the unlatched position.

   b. Position the pivot arm bracket so that the highest and lowest characters print an equal distance from the top and bottom of the red portion of a black and red ribbon.



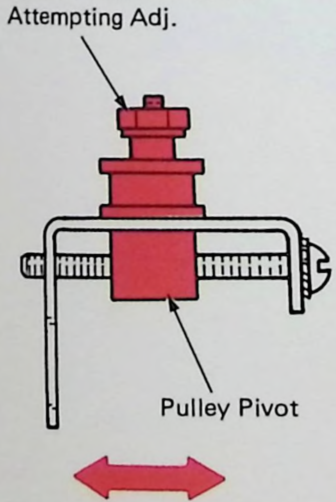
(Top View)



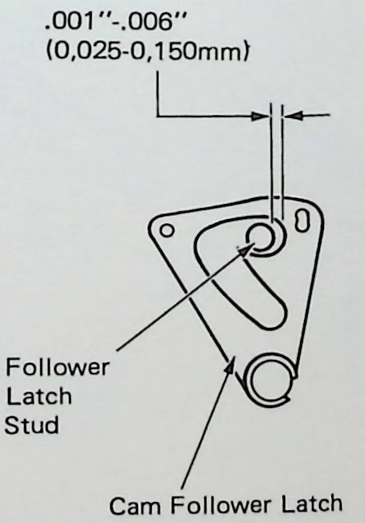
(Right Side View)

5. *Right Hand Pulley* – With the red shift armature energized, position the right hand pulley pivot to obtain .001"-.006" clearance between the stud and follower latch slot.

   NOTE: The pulley nut must be loosened before adjusting the pivot screw.



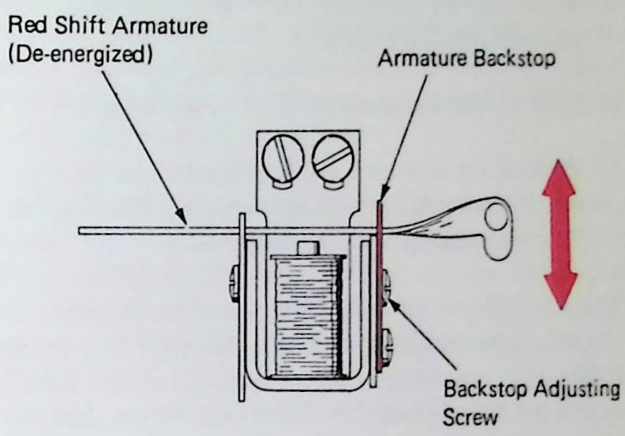
(Front View)



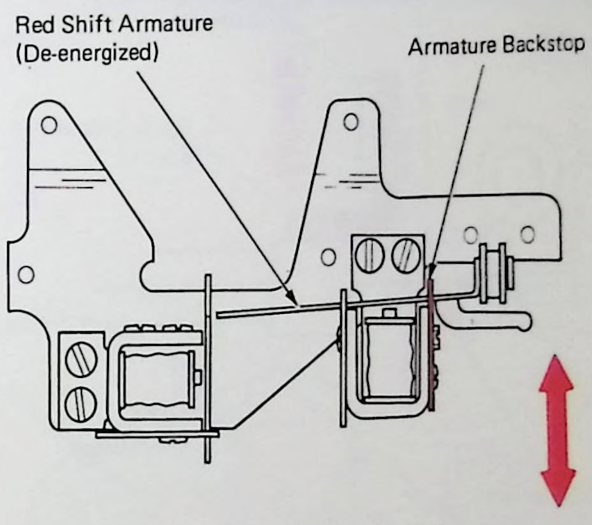
(Right Side View)

---

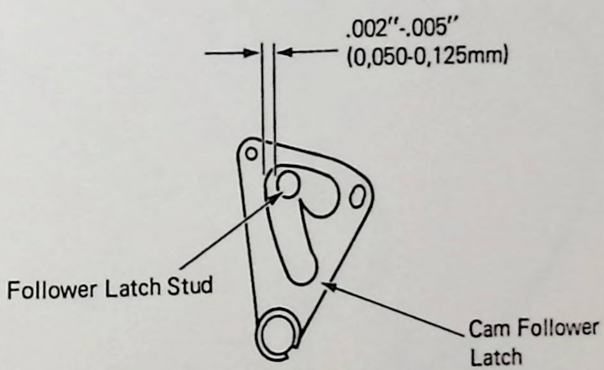
6. *Red Shift Armature Backstop (One & Two Magnet Mechanism)* – With the armature de-energized, position the red shift armature backstop to obtain .002"-.005" clearance between the stud and the follower latch slot.



(Left Side View – Level 1)



(Left Side View – Level 2)



(Right Side View)

---

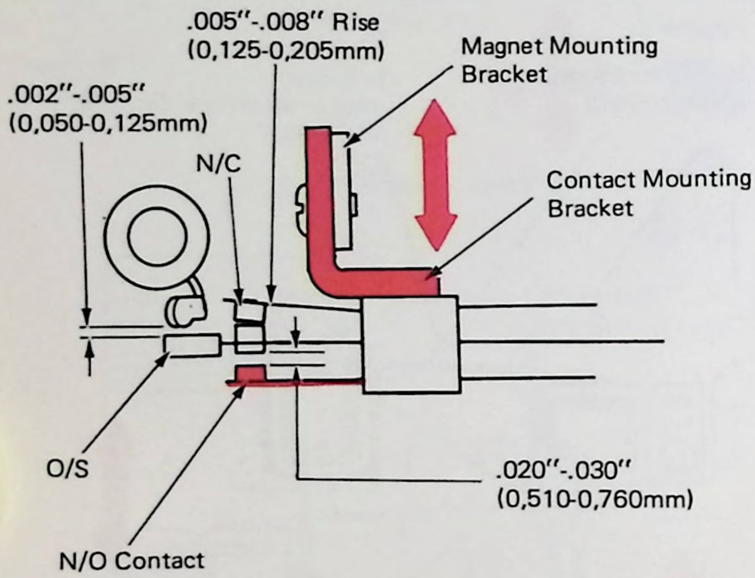
7. *Ribbon Mode Contacts* – Adjust the ribbon mode contacts for the following conditions with the red ribbon armature at rest.

   a. Form the N/C point for .005"-.008" rise when it is contacted by the O/S. b.

   b. Form the N/O contact for .020"-.030" air gap.

   c. Position the contact mounting bracket on the magnet mounting bracket so that red shift armature (at rest) clears the O/S pad by .002"-.005".

   Excessive wipe on the N/O contact may cause failure of the red magnet armature to latch. When the N/O point makes, the pulse to the magnet is removed. This is just before the armature latches. Therefore, we are depending on red armature overthrow to latch the mechanism on red ribbon.



(Front View)

NO PRINT SPACE OPERATIONAL THEORY

The no-print space feature allows the carrier to escape by operating the print escapement mechanism without allowing the typehead to strike the paper. The advantage of this feature is that no special feedback to the electronics is required to differentiate between characters and spaces.

The no-print space mechanism is a modified low velocity mechanism, and for this reason, the no-print space and low velocity feature can not both be installed.

To understand the no-print space operation it must first be realized that there are two methods of selecting a home position character (0 tilt, 0 rotate). One method is to withdraw all selection latches except the negative 5 latch. The other method is to withdraw only the tilt 2, tilt 1, and negative 5 latch. This second method is normally called the cancellation method because the motion developed by the negative 5 bail offsets the motion developed by the positive rotate latches, causing the home position character to be selected.

Now, the spacebar keylever operates an interposer in the keyboard in much the same manner as a character keylever operation. The character selection initiated by this interposer is the home position character. This character will not be printed, however, due to the no-print vane being operated by the no-print interposer.

In order for an electronic device to differentiate between a no-print space operation and the home position character "print" operation, the no-print space will use one method of selecting the home position character and the "print" operation will use the other method. (A more detailed description of the keyboard and character selection operation is covered in the Keyboard Operational Theory and Character Selection [Input] Operational Theory section of this manual.)

The low velocity magnet assembly is used to cause a no-print operation during output from an electronic device (Figure 1).

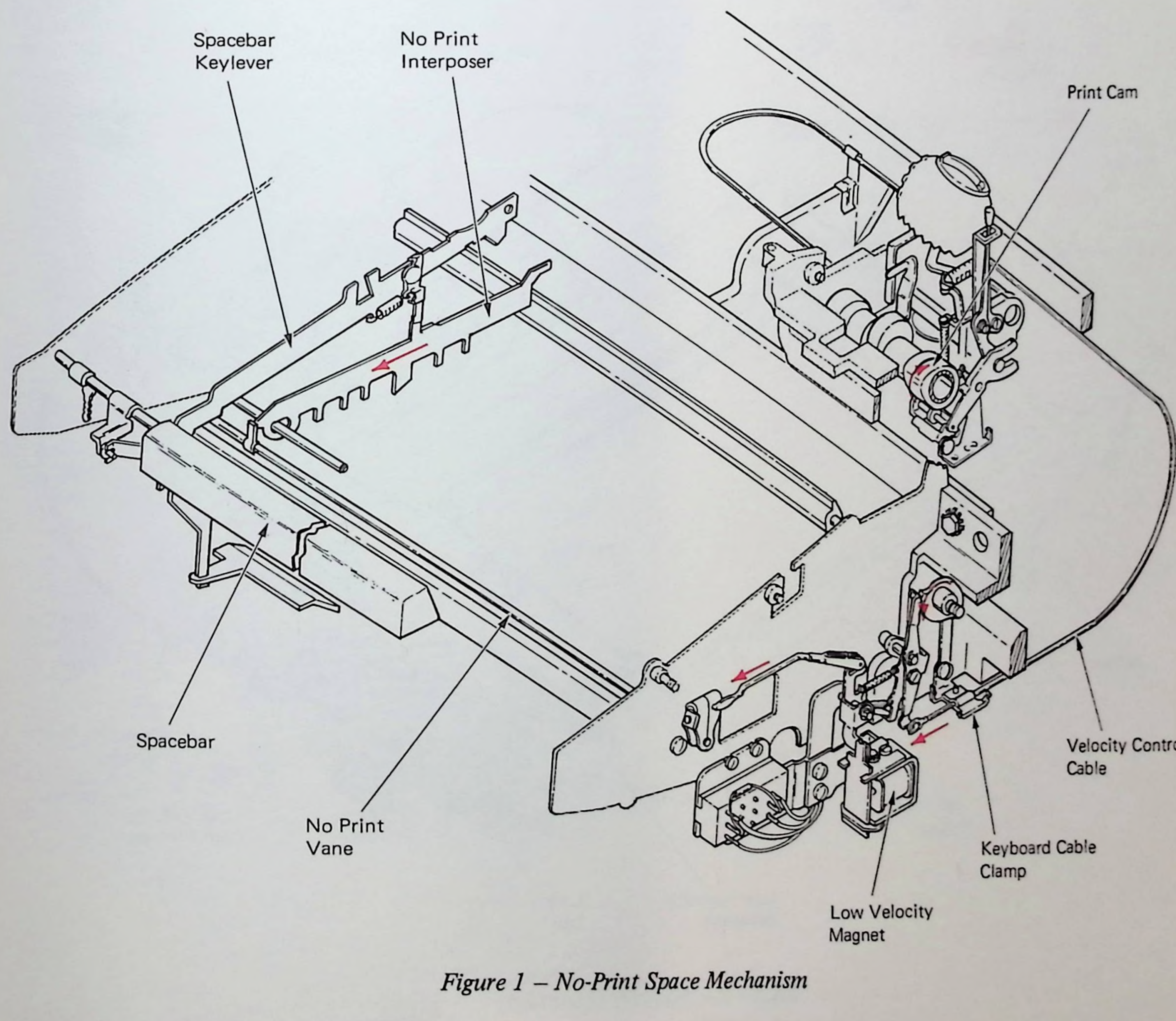
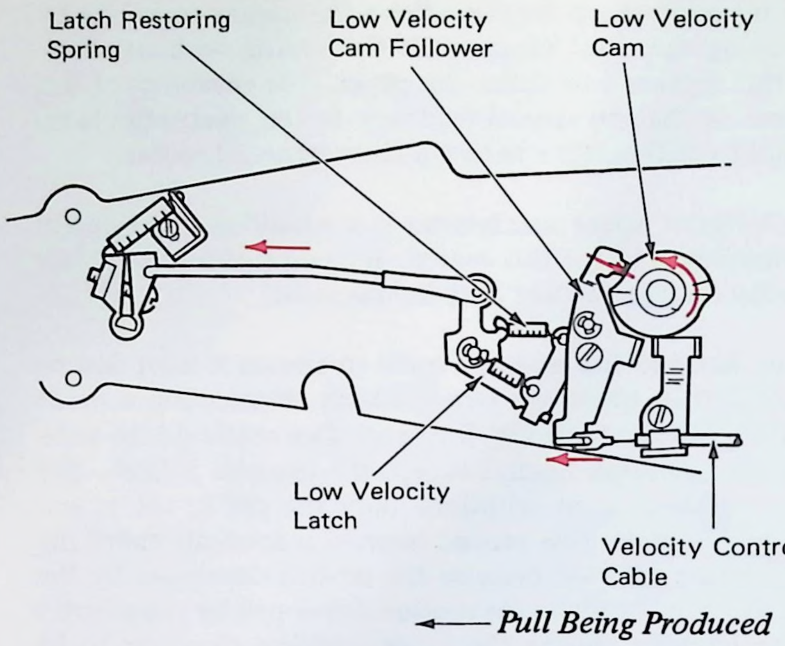


Figure 1 – No-Print Space Mechanism

NO-PRINT OPERATION

As the filter shaft drives the N.P. interposer forward, the N.P. interposer rotates the N.P. vane, (Figure 2). Rotation of the N.P. vane and low velocity bellcrank creates a pull on the link causing the low velocity latch to rotate counter-clockwise. As the low velocity latch rotates, it pivots out of the operating path of the adjustable stop attached to the low velocity cam follower. The low velocity cam follower is spring loaded against the low velocity cam. Now, when the low velocity cam rotates, the low velocity cam follower will travel to the low dwell of the low-velocity cam and create a pull on the velocity control cable.

If a character is selected at the keyboard, the low velocity latch will remain at rest in the operating path of the stop on the cam follower. The cam follower is restricted from following the contour of the cam and no pull is felt on the velocity control cable. The print cam follower roller remains to the right under the high velocity lobe of the print cam and a print operation results.



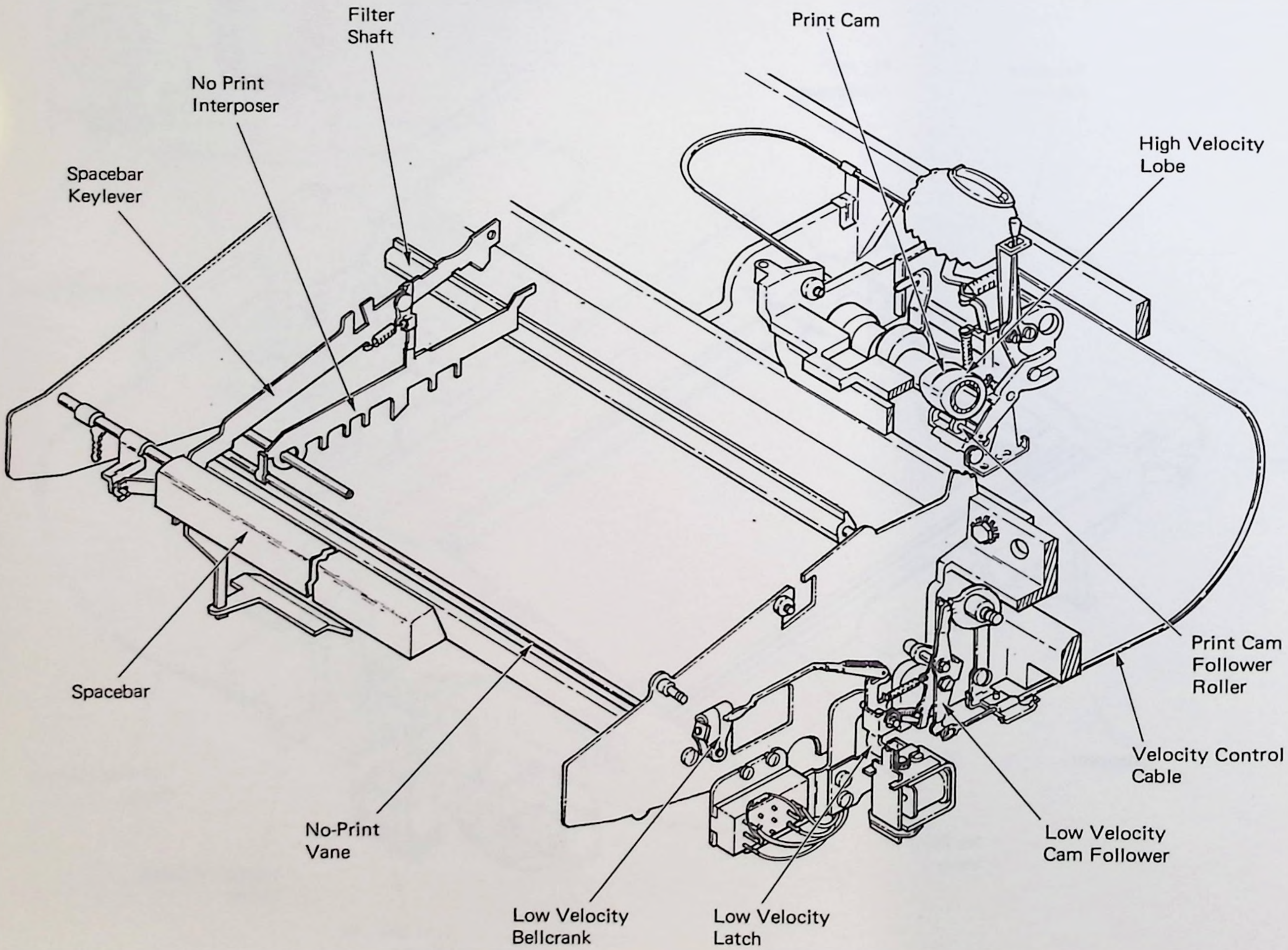


Figure 2 – No-Print Operation

PRINT CAM

The print cam is designed with two lobes (Figure 3). The lobe on the right side of the print cam is the high velocity lobe and produces sufficient velocity for a proper print operation. Print is fully discussed in the print operational section of this manual.

The lobe on the left side is the no-print lobe and has very little rise and does not provide sufficient velocity for a print operation.

The print cam follower roller is mounted on a pin and is free to be moved to the left to select a no-print operation.

The roller is positioned left to right under the desired cam lobe by a roller yoke that straddles the roller (Figure 3). A lever, called the yoke actuating lever, controls the lateral position of the yoke and roller. It mounts on the tab cord anchor bracket by a shouldered rivet. The yoke actuating lever is spring loaded at the rear and maintains the rest position of the roller **directly** beneath the high velocity lobe of the print cam.

A sheathed cable called the velocity control cable fastens to the yoke actuating lever. Whenever a pull is produced on the velocity control cable, the yoke actuating lever and roller yoke will shift the print cam follower roller from the high velocity lobe to the no-print lobe of the print cam. When the pull on the velocity control cable is relaxed, the yoke actuating lever spring shifts the roller back to its rest position beneath the high velocity lobe of the print cam.

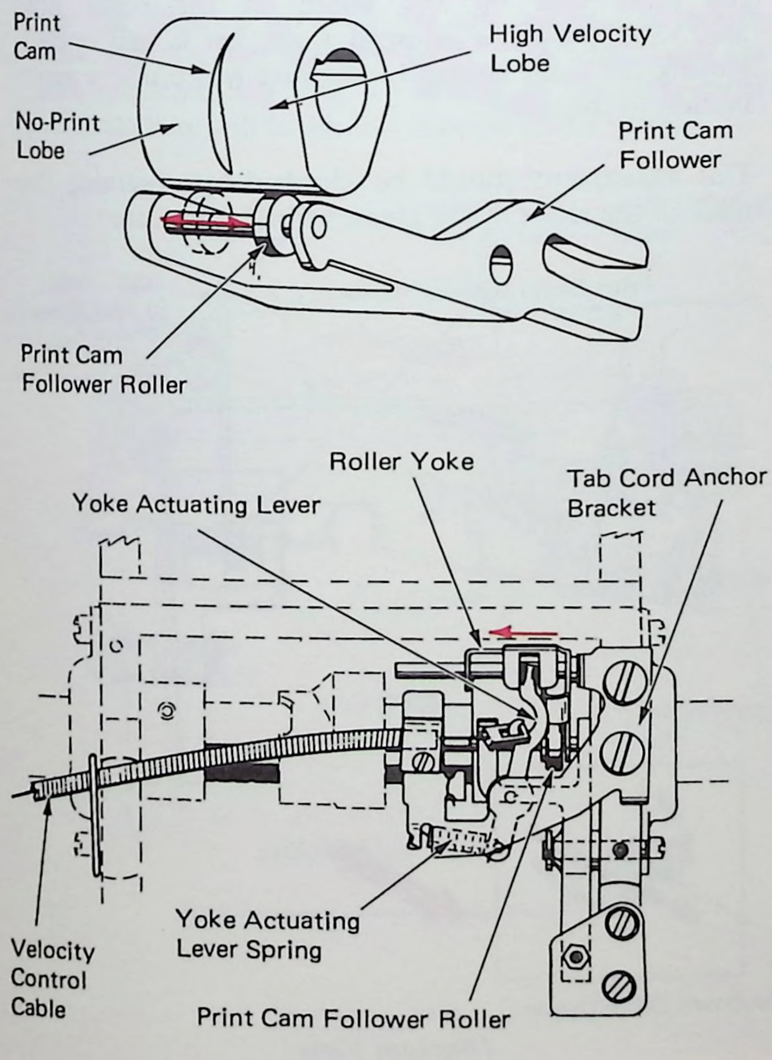


Figure 3 – Yoke Actuating Lever And Spring (Bottom View)

PRINT CAM FOLLOWER STOP SCREW

To prevent the print cam from interfering with the print cam follower roller as it shifts from one lobe to the other (Figure 4), the print cam follower and roller are held disengaged from the print cam by an adjustable stop screw until the roller has shifted. The stop screw contacts the rear of the print cam follower.

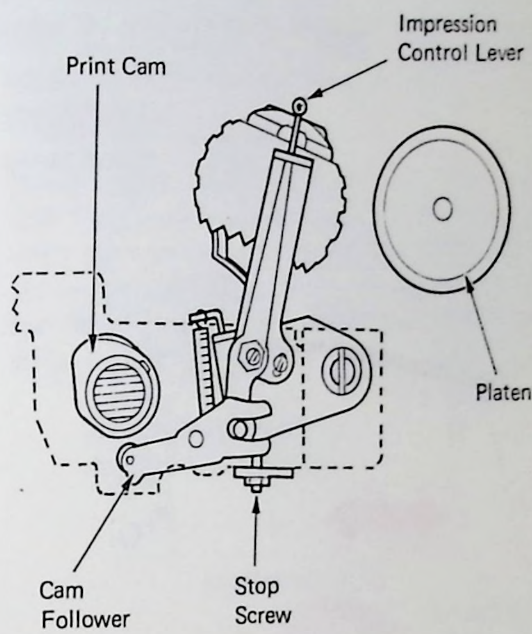
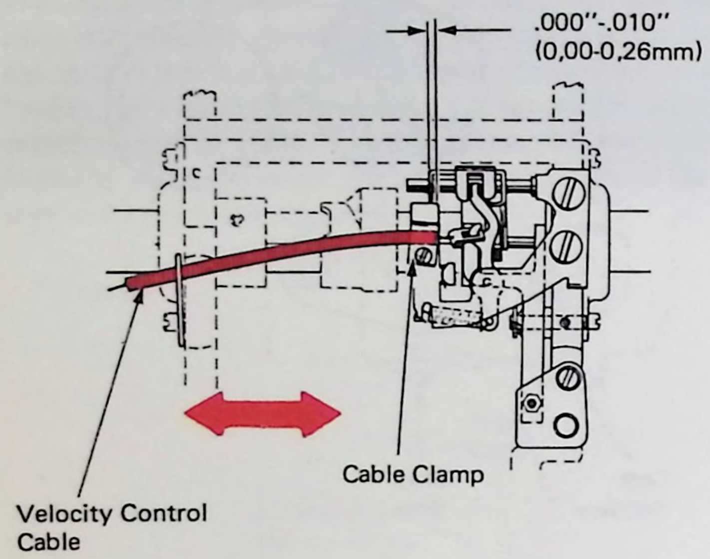


Figure 4 – Print Cam Follower Stop Screw (Right Side View)

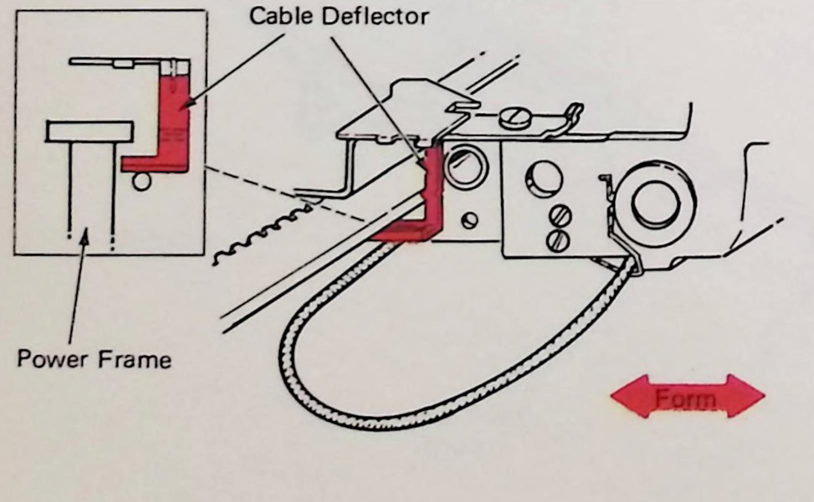
Adjustments 1 through 12 in the print operational control section must be correct before making the no-print adjustments.

1. *Velocity Control Cable Clamp* – Adjust the cable sheath left to right under the carrier clamp until the end of the sheath is flush to .010" recessed with the right hand edge of the cable clamp. This adjustment prevents the yoke actuating lever from choking off against the cable sheath.



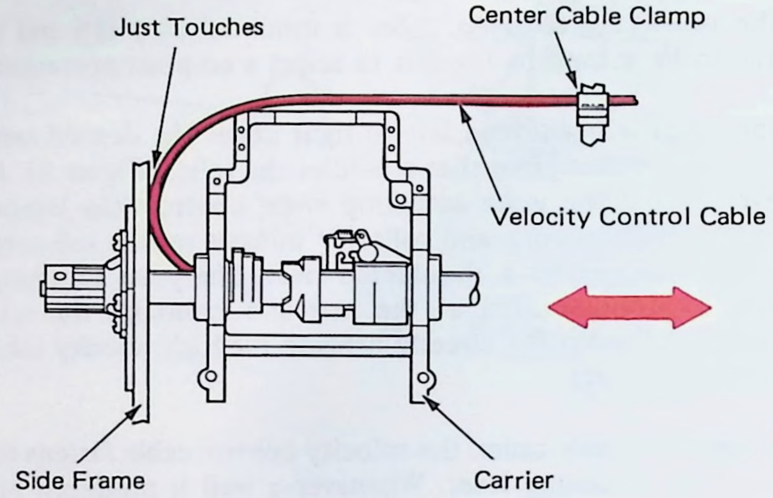
(Bottom View – Level 2)

2. *Carrier Cable Deflector* – For the deflector to the rear as far as possible without touching the power frame.



(Left Side View)

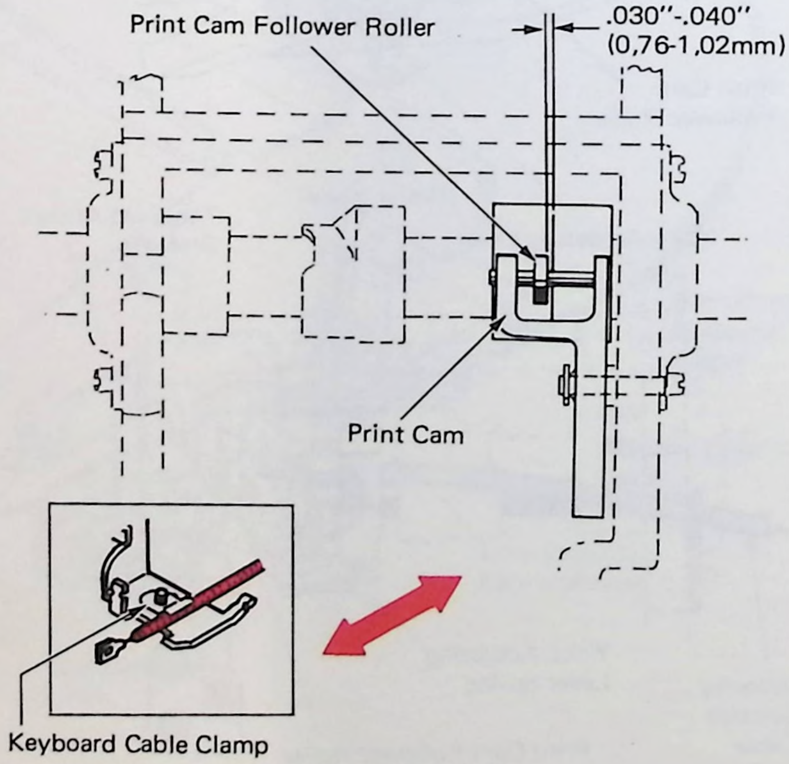
3. *Center Cable Clamp* – Position the cable sheath left to right within the center cable clamp so the bend in the cable will just touch the machine left side frame when the carrier is resting two spaces from the extreme left margin. This adjustment allows the carrier to operate freely along the entire writing line and allows the velocity control cable to operate with a minimum of flexing.



(Top View)

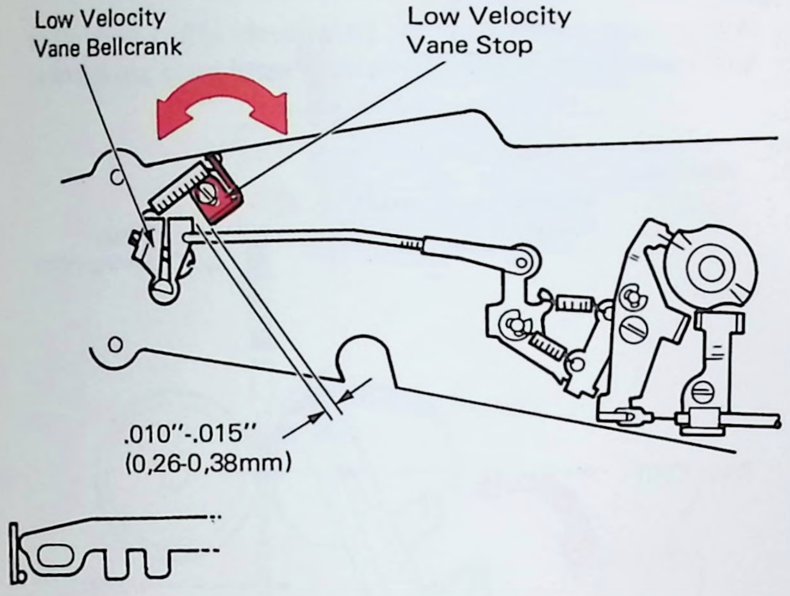
4. *Velocity Control Keyboard Cable Clamp* – Adjust the cable sheath front to rear under the clamp so the print cam follower roller will shift onto the no-print lobe of the print cam by the width of the roller plus .030"-.040" when a no-print space bar is half cycled. Moving the cable sheath to the rear will produce more motion to the roller.

This adjustment should be checked by observing the track of the roller in the grease on the print cam.



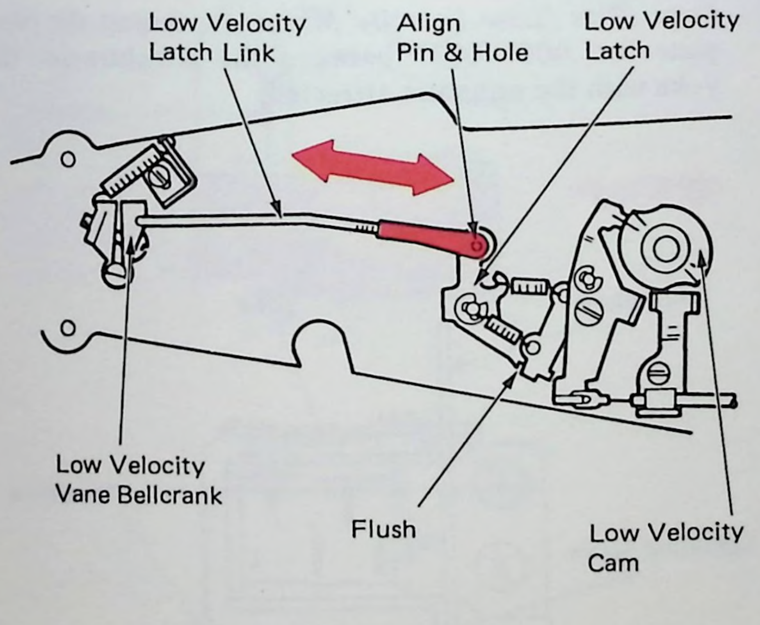
(Bottom View)

5. *Low Velocity Vane Stop* – Adjust the low velocity vane stop for a clearance of .010"-.015" between the stop and the low velocity vane bellcrank when the bellcrank is held at rest.



(Right Side View)

6. *Low Velocity Latch Link* – With the machine at rest, the low velocity latch link should be adjusted to just span the distance between the low velocity vane bellcrank and the low velocity latch. This adjustment ensures the latch will take a full bite on the adjustment stop and there will be no lost motion in the system.



(Right Side View)

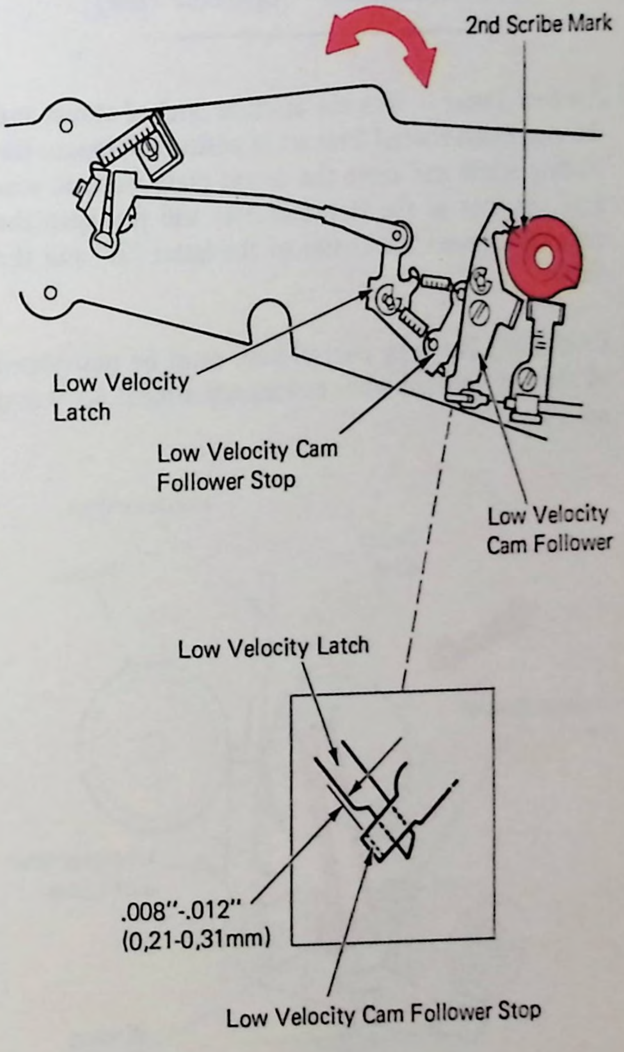
7. *Low Velocity Cam Adjustment* – When a no-print space is slowly hand cycled, the low velocity latch should clear the adjusting stop on the cam follower by .008"-.012" just as the cam follower scribe mark lines up with the second scribe mark on the low velocity cam. Advance or retard the cam to satisfy this condition.

This adjustment can easily be made in the following manner:

a. With the machine at rest, align the first scribe line on the low velocity cam with the scribe line on the cam follower.

b. Hand cycle the machine and observe the .008"-.012" clearance between the latch and stop when the cam follower scribe line is aligned with the second scribe line on the low velocity cam. Refine the cam adjustment slightly to satisfy this condition.

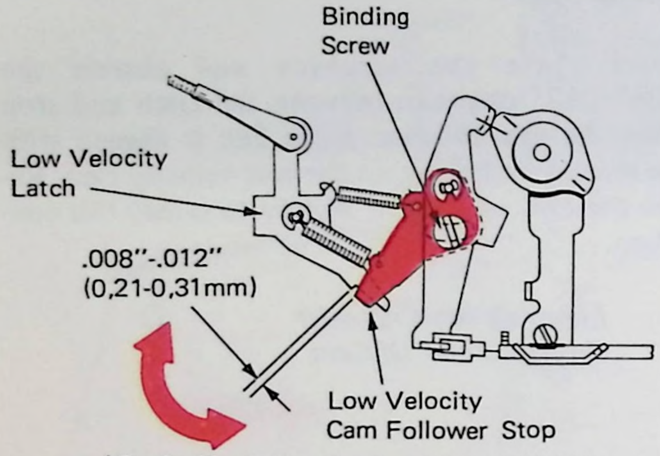
Low Velocity Character
On High Point Of Cam



(Right Side View)

8. *Low Velocity Cam Follower Stop* – With the cycle shaft latched at rest, adjust the low velocity cam follower stop for .008"-.012" clearance with the low velocity latch. Loosen the binding screw and rotate the low velocity cam follower stop to satisfy this condition.

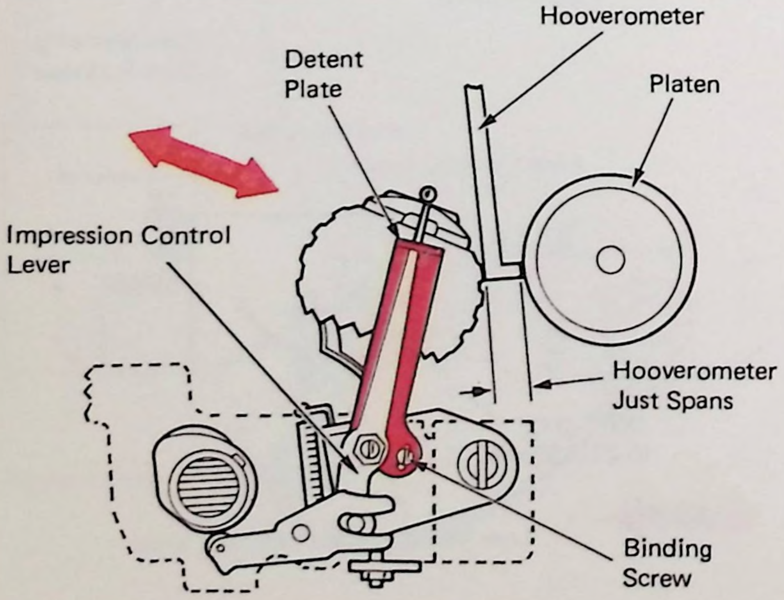
Too little clearance may prevent latching of the low velocity latch resulting in a continuous no-print operation for all characters. Too much clearance may allow a slight pull to be produced on the cable during a high velocity operation which could shift the roller partially onto the no-print lobe.



(Cycle Shaft Latched – Right Side View)

9. *Powered Travel* – With the machine latched at rest and the impression control lever set at position 4, loosen the binding screw and move the detent plate front to rear until the foot of the Hooverometer will just span the distance between the center of the letter "Z" and the platen.

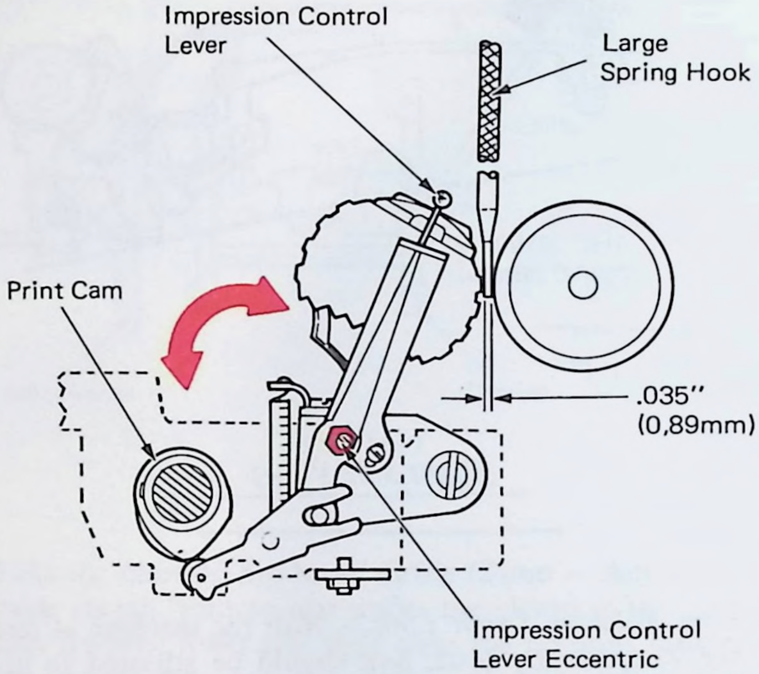
CAUTION: The copy control lever must be positioned all the way forward when making adjustment no. 9 and no. 10.



(Stick 4 Position "0" Rotate, Rest Position – Right Side View)

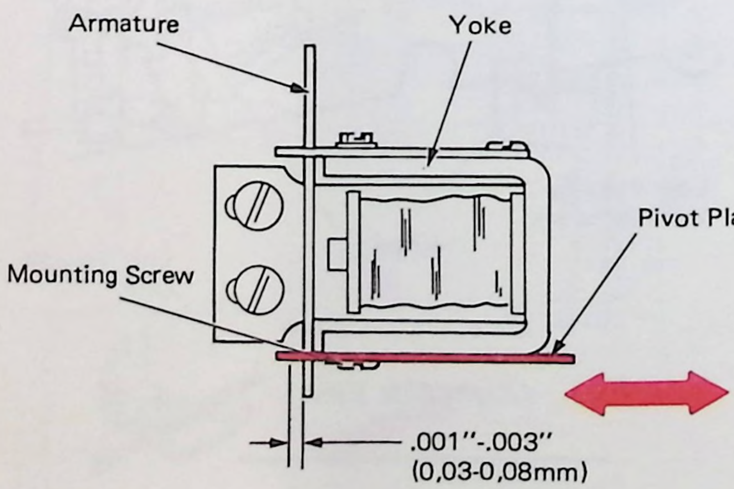
10. *Free Flight* – With the impression control lever set at 4 and a ϕ tilt, ϕ rotate character hand cycled until the machine is resting on the high point of the print cam, the pusher end of a large spring hook (.035") should just span the distance between the character and the platen. Adjust the eccentric on the impression control lever to obtain this condition, keeping the high part of the eccentric forward.

Adjustment no. 9 and no. 10 directly affect each other and must be adjusted alternately until both are correct.



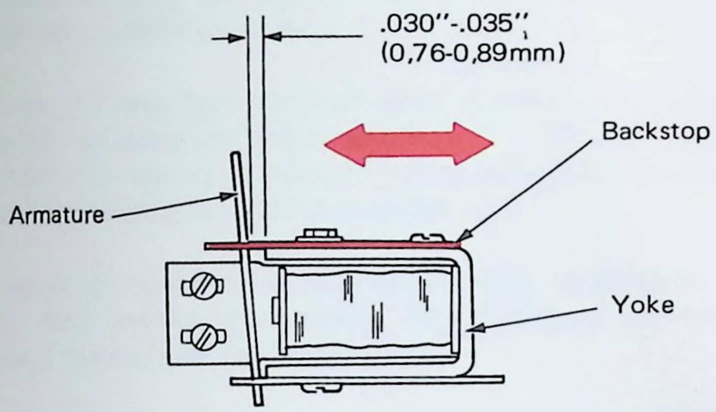
(Right Side View)

11. *Pivot Plate (Low Velocity Magnet)* – Adjust the pivot plate for .001"-.003" between the armature and the yoke with the armature attracted.



(Right Side View

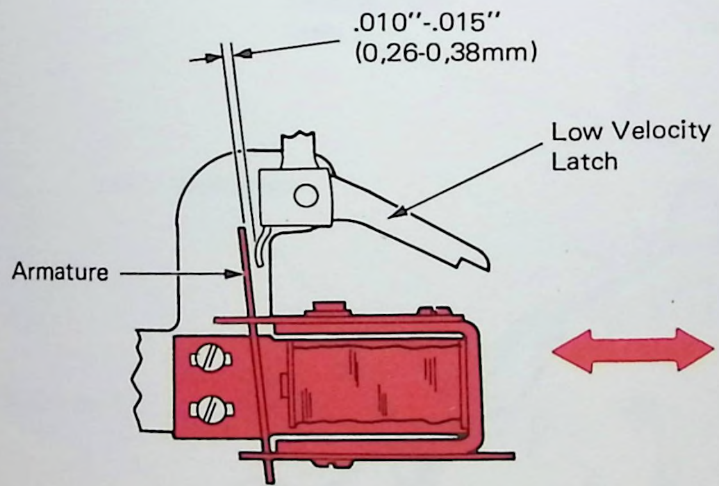
12. *Armature Backstop* – Position the backstop for .030"-.035" between the armature and yoke with the magnet de-energized.



(Right Side View)

---

13. *Low Velocity Magnet Assembly* – With the armature held in a de-energized position, adjust the magnet front to rear to obtain .010"-.015" clearance between the armature and the low velocity latch.



(Right Side View)

The reverse index mechanism provides a means of automatically indexing the platen one-half line space above or below the normal writing line.

The operator may type one-half space above the line (superscript) by pressing the button marked ↑ (Figure 1). The operator may also type one-half space below the line (subscript) by pressing the button marked ↓

A superscript operation is accomplished by rotating the reverse index ratchet one tooth. This positions the paper one-half space above the writing line.

A subscript operation is accomplished by first performing a normal index operation which positions the paper one "full" space below the writing line, then performing a reverse index operation which brings the paper back to "one-half" space below the writing line.

On "Selectric" I/O Typewriters equipped with reverse index, the carrier return mechanism is always a non-repeat function and the index keylever is inoperative. The indexing ratchet is always a 54 tooth ratchet.

There is no mechanical connection between the reverse index keybuttons and the reverse index magnet. Instead, depression of one of the reverse index keybuttons completes a circuit to the connected electronic device, which in turn, energizes the proper magnets in the "Selectric" I/O. The electronic device must be programmed to interpret the various signals generated in the I/O for operation of the reverse index mechanism.

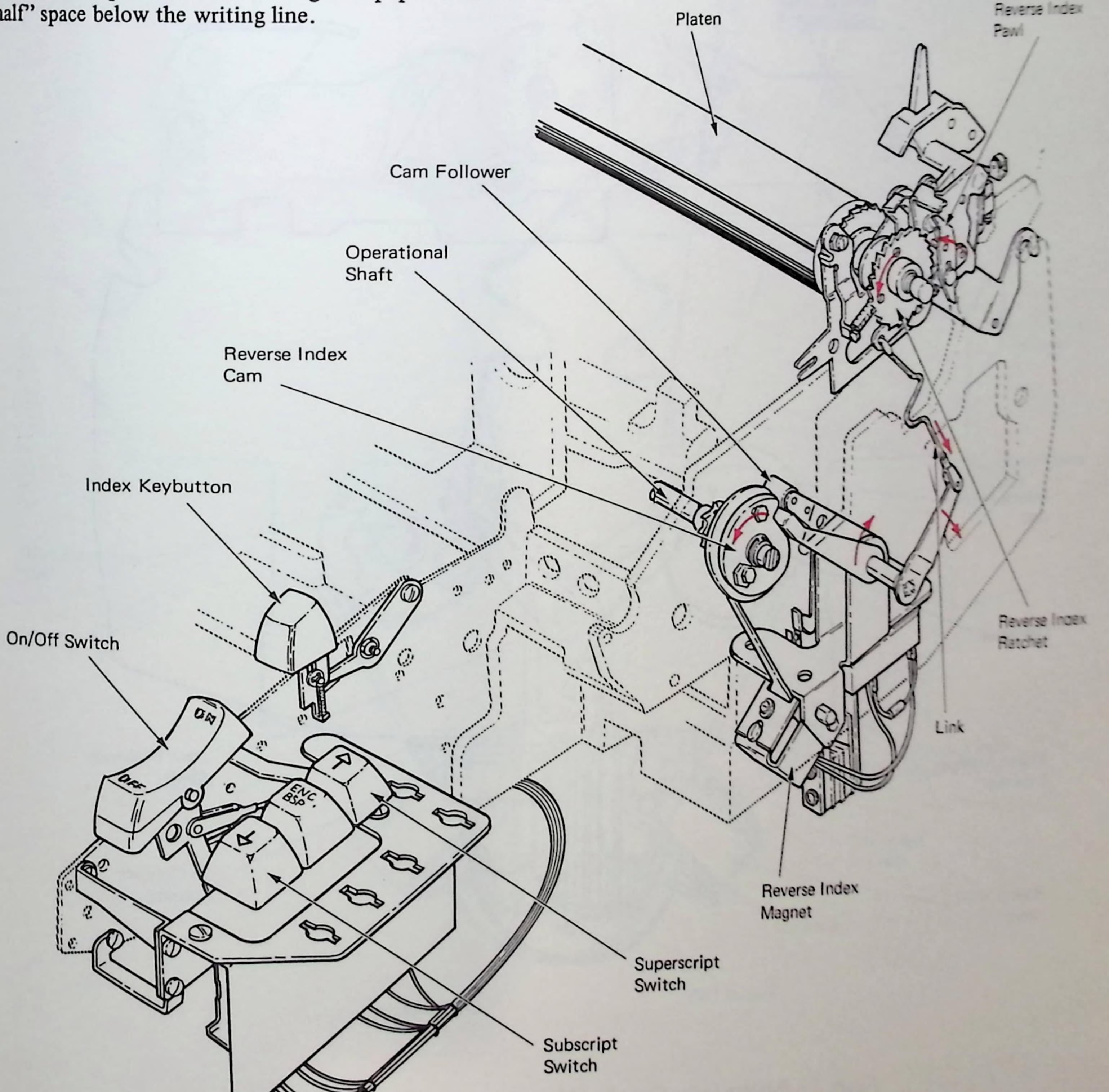


Figure 1 – Reverse Index Mechanism

REVERSE INDEX CAM & MAGNET

The reverse index magnet is mounted on the powerframe below the reverse index cam. The magnet armature engages the cam wheel (Figure 2) to perform the same function as the cam release lever discussed in the Operational Control section of this manual. Mounted on the same bracket with the reverse index magnet is the reverse index cam follower, the reverse index check pawl and the C8 contact actuator. The reverse index cam follower is setscrewed to a shaft which extends to the right through the powerframe. The check pawl is free to pivot on the cam follower shaft and perform the same function as the check pawl discussed in the Operational Control section of this manual.

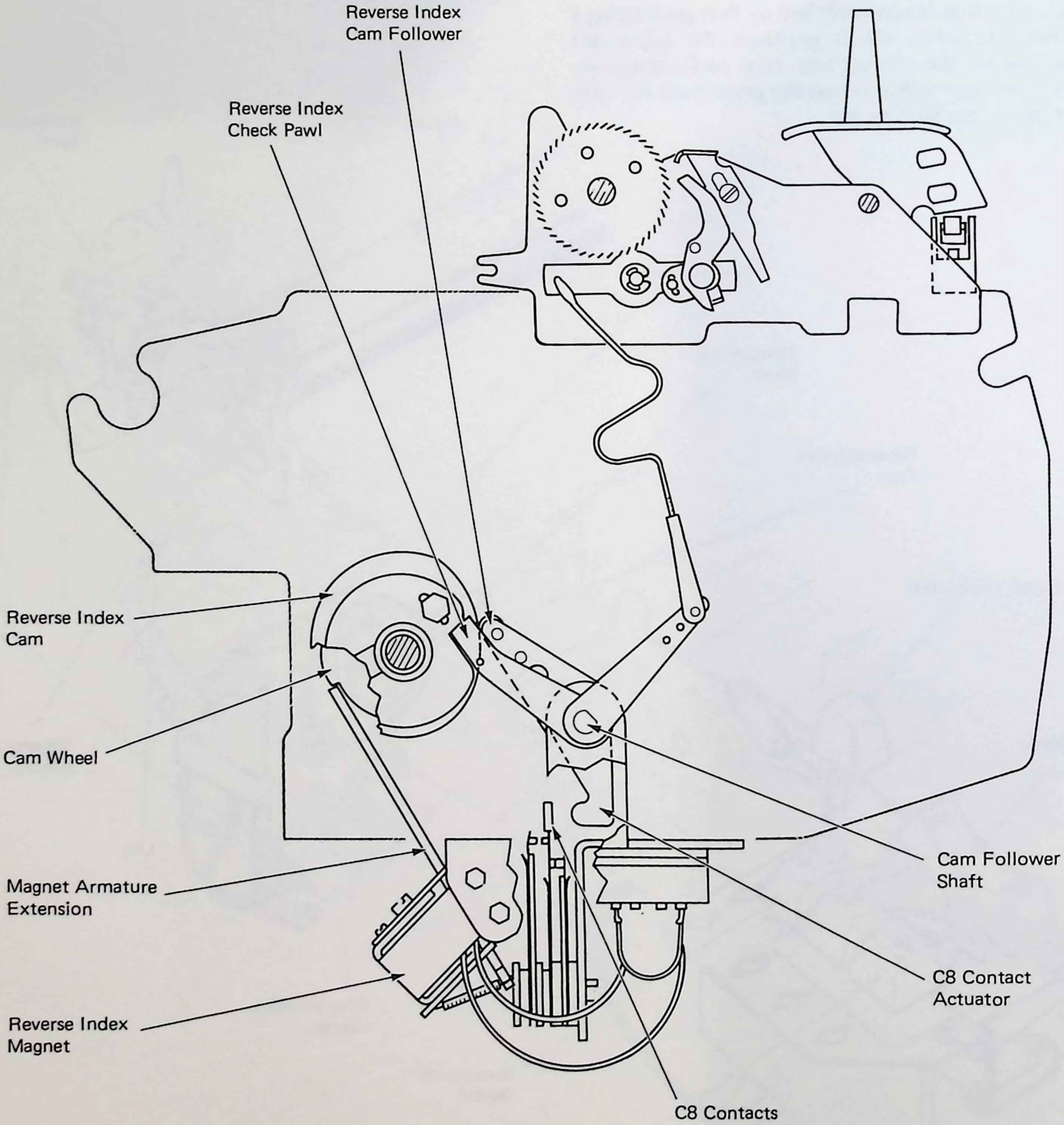


Figure 2 – Reverse Index Cam And Magnet (Right Side View)

PAWL OPERATION

As the reverse index cam rotates, the reverse index cam follower and reverse index operating arm will rotate (Figure 3). The reverse index link is pulled down causing the reverse index pawl lever to rotate. As the index pawl moves, it engages the reverse index ratchet, rotating it until the pawl wedges between the reverse index ratchet and the pawl overthrow stop. The reverse index link is designed to relieve stress on the system if any further motion remains.

The C-8 contact actuator is setscrewed to the cam follower shaft. The C-8 contact is mounted to the powerframe below the C-8 contact actuator. During a reverse index cycle the C-8 contact transfers indicating two things to the connected electronics.

First, when the normally closed (N/C) point breaks, the pulse to the reverse index magnet should be terminated. Second, the duration of time the normally open (N/O) point is made should be used to prevent transmission of any additional signals to the I/O.

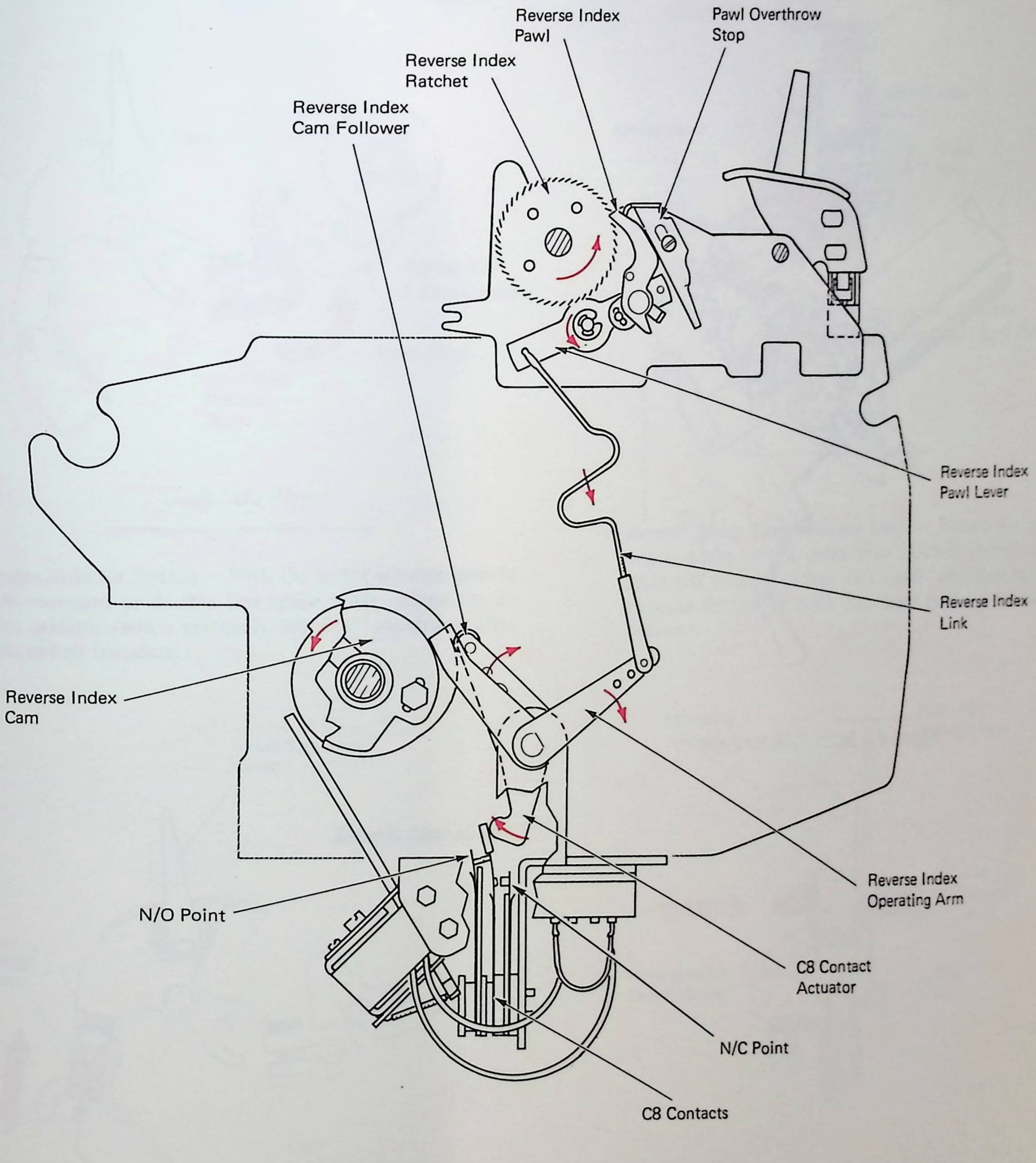


Figure 3 – Pawl Operation (Right Side View)

INDEX SELECTOR LEVER

The index selector lever on machines equipped with reverse index operates no mechanical linkages as in the standard index mechanism, but instead transfers a switch. When the index selector lever is in its normal position two ratchet teeth are fed for each operation of the carrier return or index mechanisms. However, when the index selector lever is to the rear or double line space position, the switch is transferred and the electronic device must initiate the second line space operation in order to double index the paper. See the Index Operational Theory Section for the normal index mechanism.

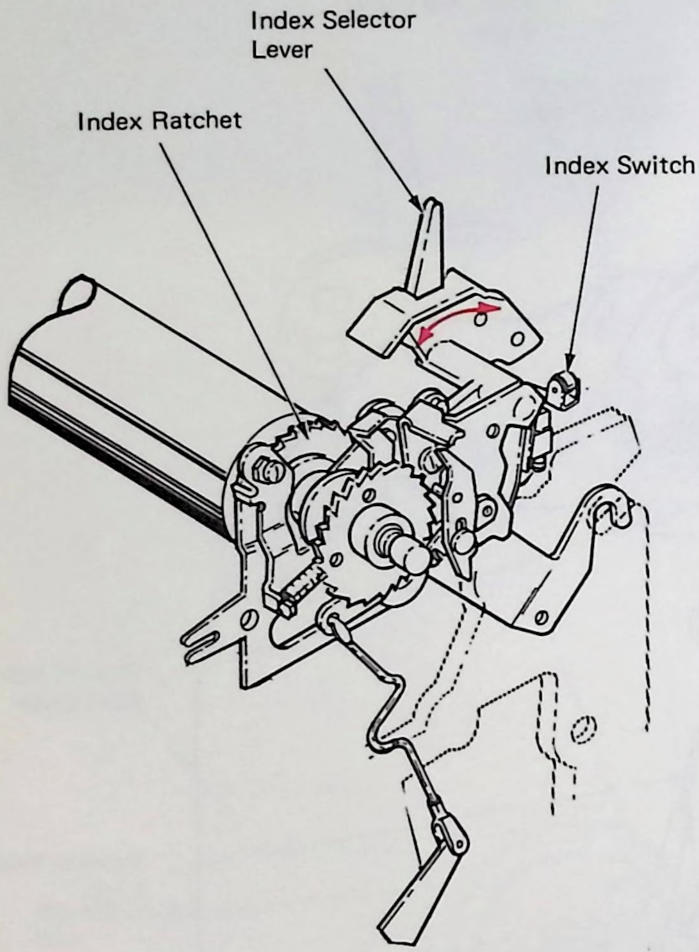
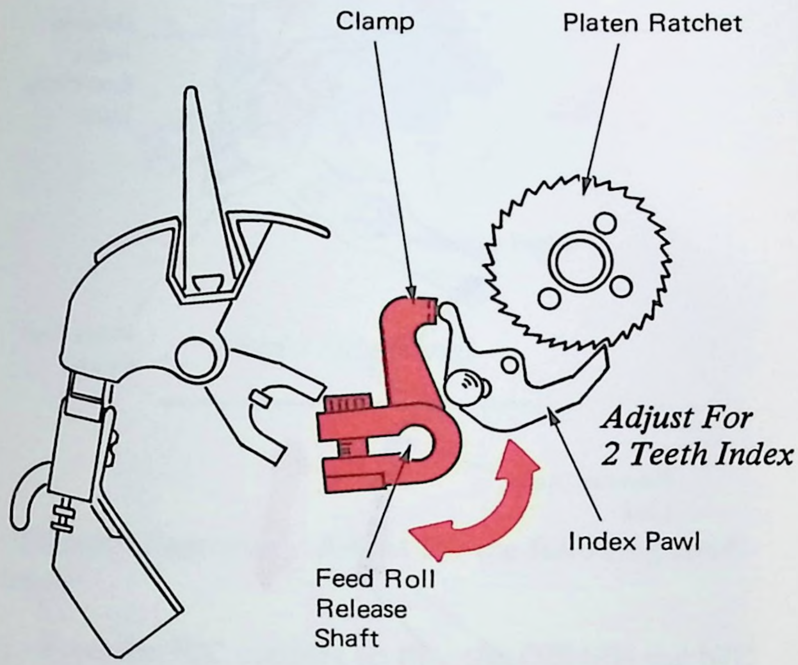


Figure 4 – Index Selector Lever

REVERSE INDEX ADJUSTMENTS

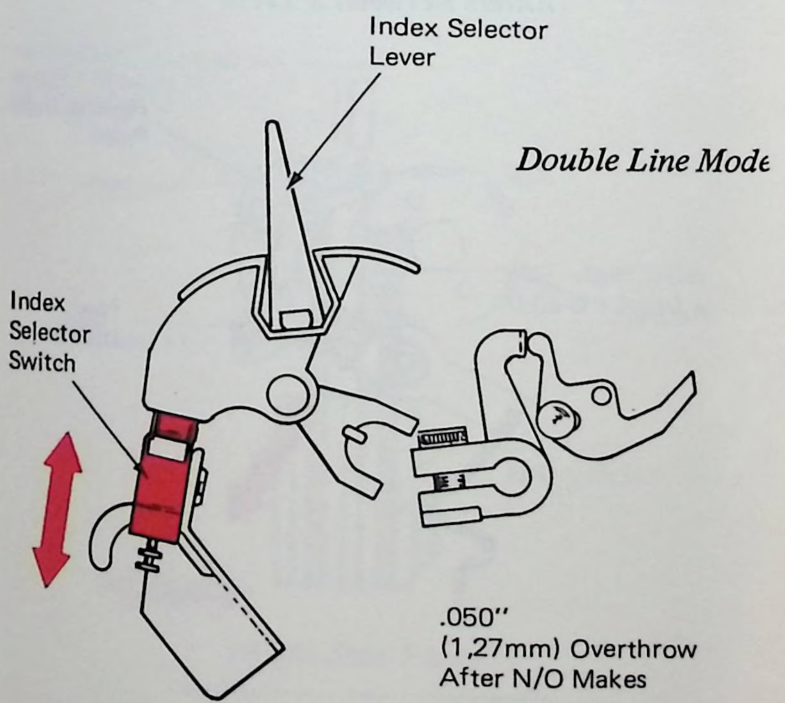
Adjustment one replaces adjustment 14 of the Paper Feed and Index Section when the reverse index feature is installed.

1. *Index Pawl Entry* – Position the clamp on the feed roll release shaft so the index pawl enters the platen ratchet between two teeth so that two ratchet teeth will be fed during the index cycle.



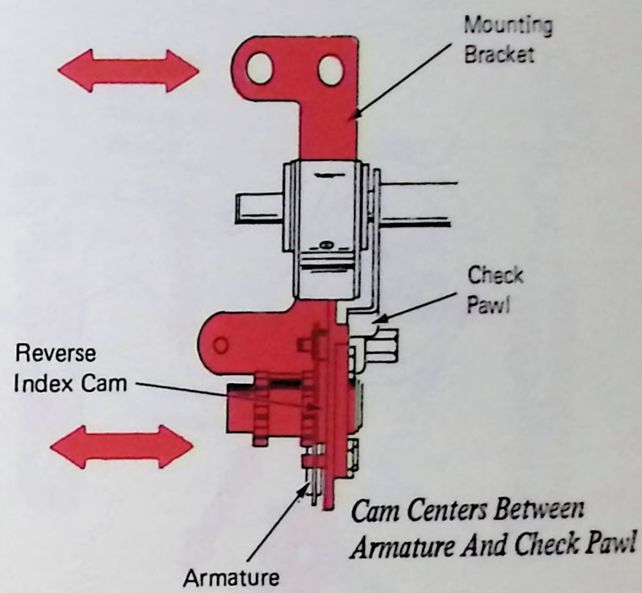
(Left Side View)

2. *Index Selector Switch* – With the index selector lever in the rearward or double line space mode, adjust the index selector switch vertically for .050" overthrow after the switch transfers.



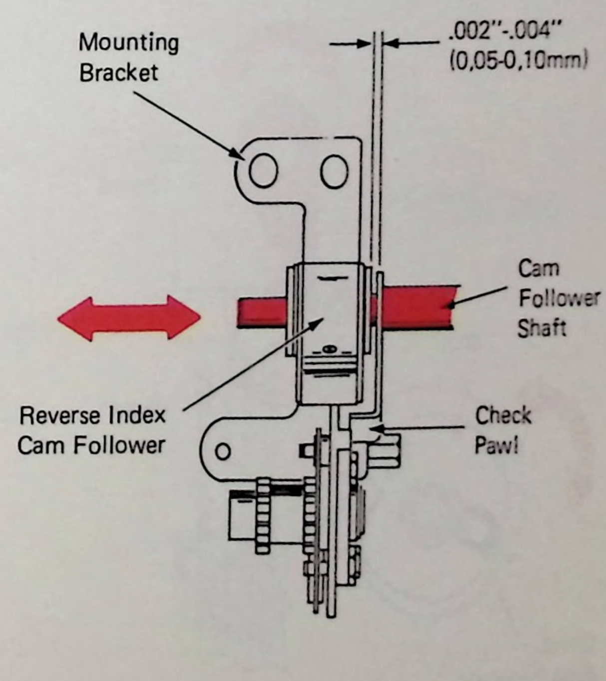
(Left Side View)

3. *Reverse Index Cam and Reverse Index Magnet Mounting Bracket* – Adjust the reverse index cam and the reverse index magnet mounting bracket alternately so that the reverse index cam is centered between the reverse index magnet armature and the check pawl. NOTE: Make sure neither the magnet armature nor the check pawl hits the sides of the cam.



(Top View)

4. *Reverse Index Cam Follower Shaft* – Loosen the setscrew in the reverse index cam follower. Adjust the shaft left to right so that .002"-.004" clearance exists between the reverse index cam check pawl and the cam follower.

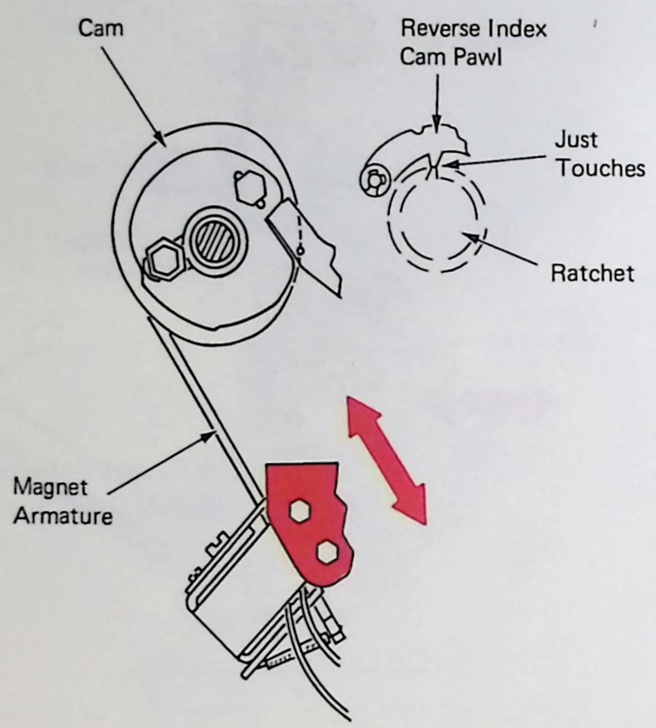


(Top View)

5. *Reverse Index Cam Pawl* – Adjust for a clearance of .005" between the cam pawl and the tip of a ratchet tooth using the following procedure.

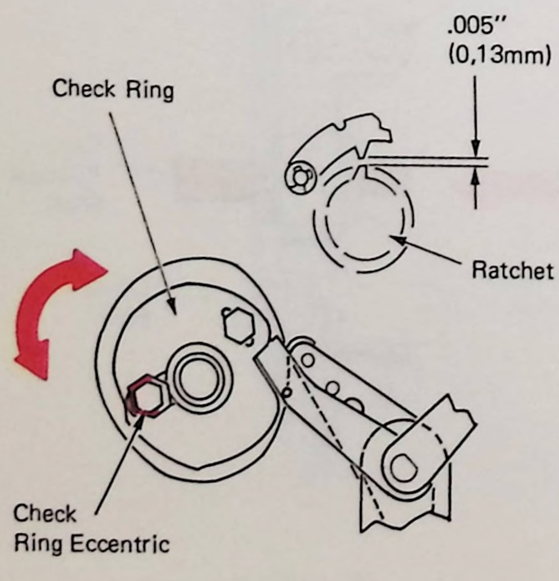
a. Adjust the reverse index magnet assembly up or down so the tip of the reverse index cam pawl and the tooth of the ratchet just touch.

NOTE: Make sure the magnet armature does not hit the side of the cam. The armature must be square on the clutch wheel.



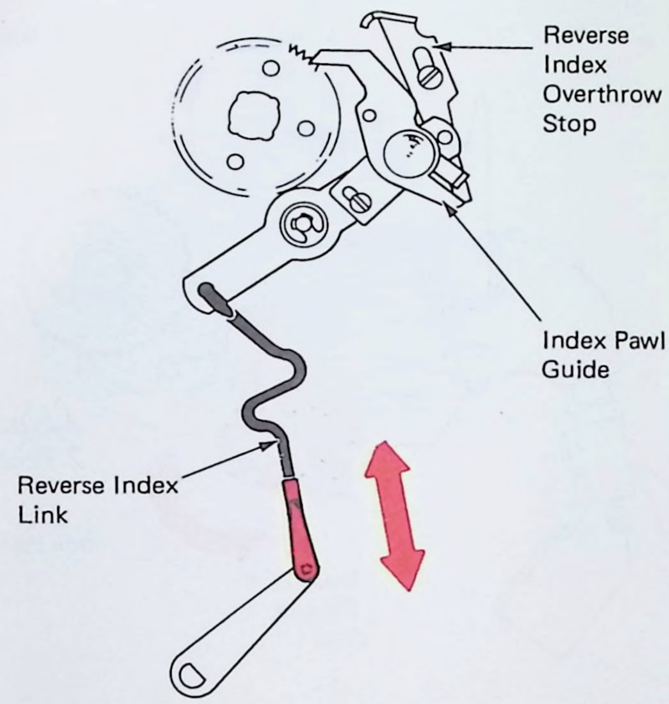
(Right Side View)

b. Adjust the check ring eccentric so a clearance of .005" exists between the tip of the reverse index cam pawl and the ratchet.



(Right Side View)

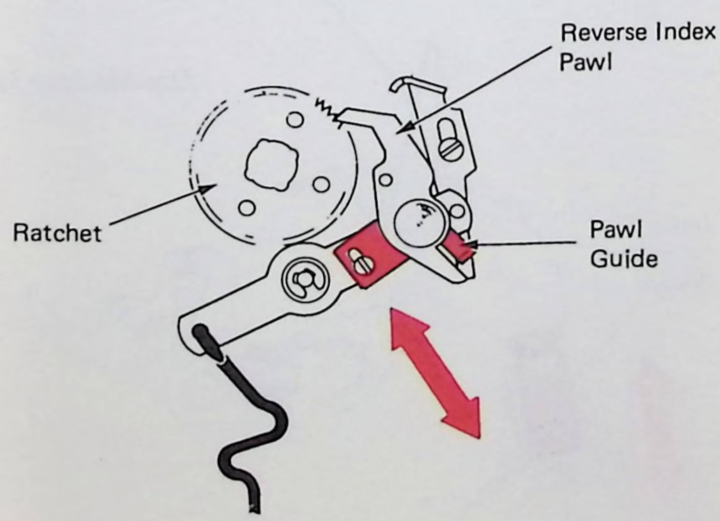
6. *Reverse Index Link* – Prior to adjusting the reverse index link, move the reverse index overthrow stop out of the way. Also, pre-adjust the reverse index pawl guide so the binding screw is in the bottom of the slot. Then adjust the reverse index link so it will drive the platen one full tooth when the reverse index cam is cycled by hand. One tooth of motion can be seen by viewing the detent action on the forward index ratchet.



(Right Side View)

7. *Reverse Index Pawl Guide* – Adjust so the reverse index pawl reliably enters the ratchet between two teeth.

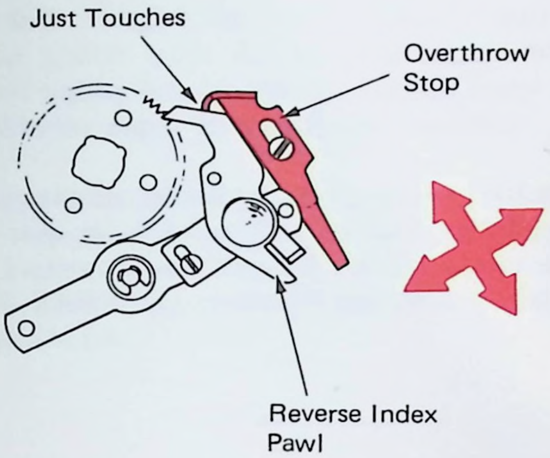
Enters Between 2 Teeth



(Right Side View)

8. *Reverse Index Pawl Overthrow Stop* – With the reverse index cam on the high point, adjust the reverse index overthrow stop so it just touches the reverse index pawl.

Cam On High Point



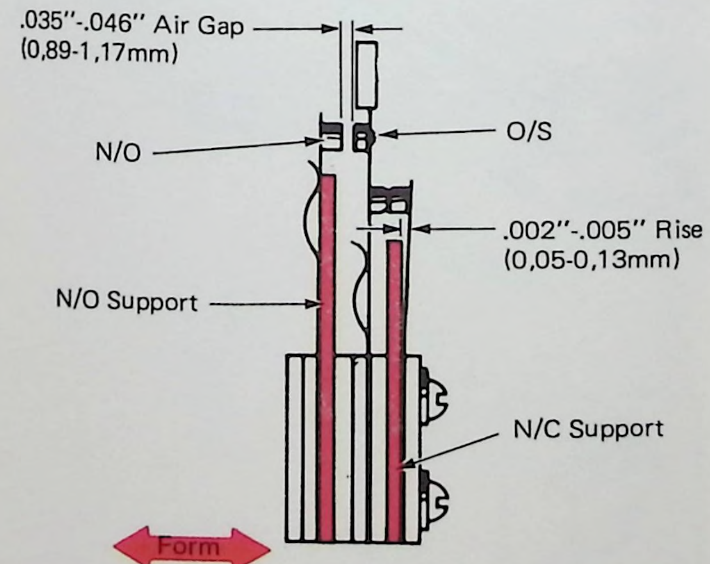
(Right Side View)

9. *C8 Contact Supports* – Adjust for the following conditions:

   a. Form the N/C support so that the O/S lifts the N/C contact .002"-.005" (rise).

   b. Form the N/O support for .035"-.046" air gap between the O/S and N/O contacts.

   NOTE: This is a preliminary adjustment and may have to be altered slightly to achieve Adjustment Number 13.

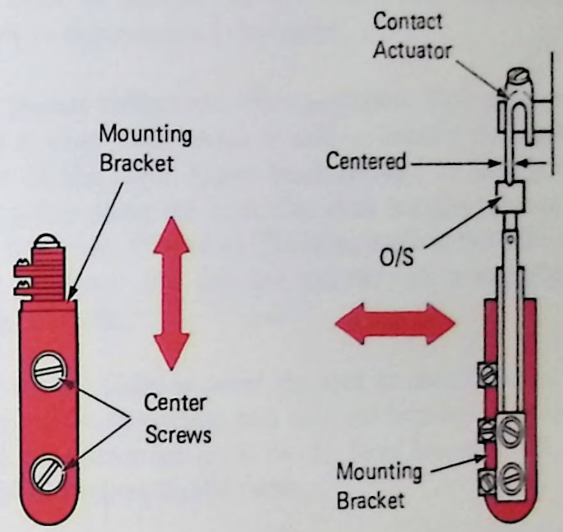


(Right Side View)

10. *C8 Contact Mounting Bracket* – Adjust the mounting bracket for the following two conditions:

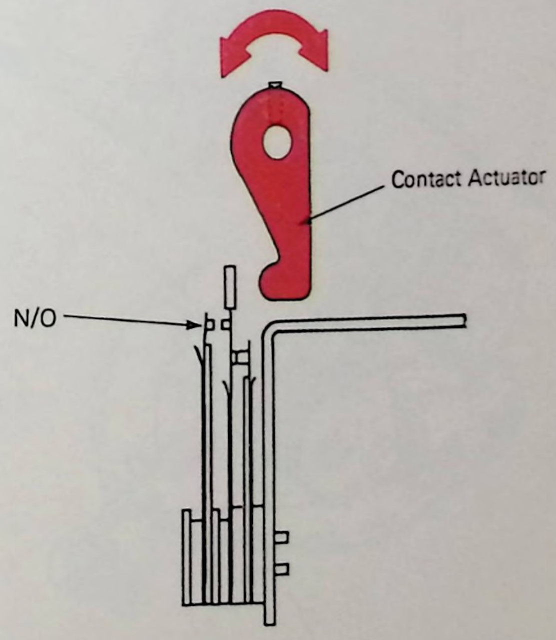
   a. Front and rear so that the mounting screws are centered in the enlarged mounting holes.

   b. Left and right so that the contact actuator is centered on the O/S.



(Bottom View) *(Front View)*

11. *C8 Contact Actuator* – Rotate the contact actuator so the N/O point makes at 240° ± 5°. Transfer time should be 3° to 9°.



(Right Side View)

VERTICAL FORMS CONTROL OPERATIONAL THEORY

The purpose of the vertical forms control feature (Figure 1) is to provide automatic positioning of continuous form documents. This reduces the need for the operator to carrier return and roll up the platen to align the form to the various typing positions. This feature also provides a signal that can be used to energize the index magnet to automatically index the platen from the last typing line on one form to the first typing line on the next form, (index operation is covered in the paper feed and index section).

An end-of-forms switch, mounted on the paper feed assembly, is used to stop the print out when the forms supply is exhausted. A lockout plate, located on the center cover, can be used to inhibit the end-of-forms switch whenever this feature is not in use.

This feature uses a modified pin feed platen. Only the modifications will be discussed in this section. Normal pin feed platen operation is covered in that section of this manual.

A plug and socket assembly is provided so the vertical forms control platen may be removed, and substituted with a standard platen. Whenever the vertical forms control platen is removed and a standard platen installed, a jumper plug must be inserted into the socket. This completes the circuit to the connected electronics.

This feature utilizes two chain assemblies. Each chain contains a silver bead which is used to identify the starting point of the chain. Larger beads are used to identify the stop points along the form. One chain is called the stop or first line chain (Figure 1). The larger beads in this chain are used to detect the first line and the various stop points along the form.

The second chain is called the start or overflow chain. It contains the silver bead plus only one large bead. The large bead represents the point on the form beyond which no additional typing should occur.

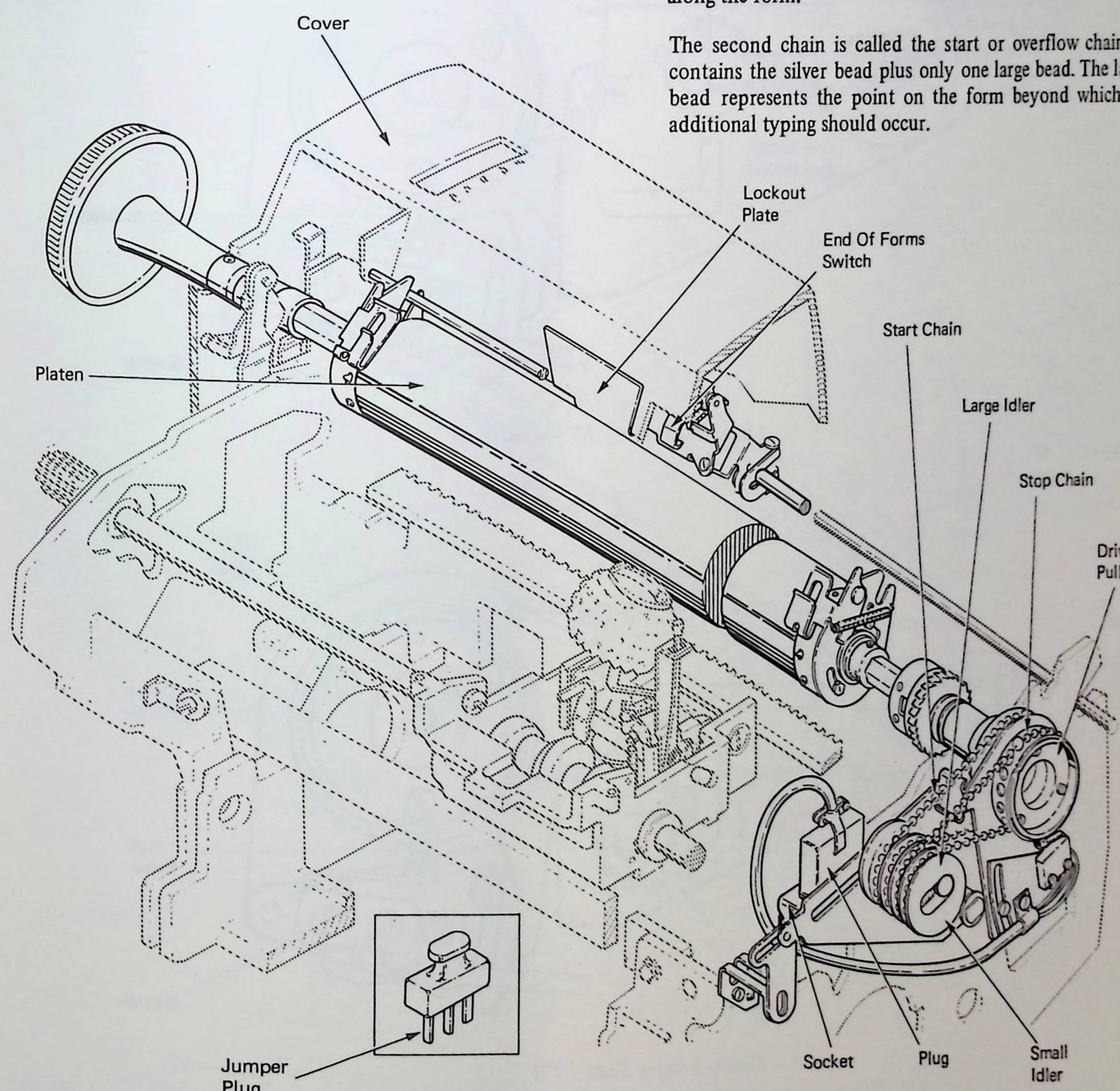
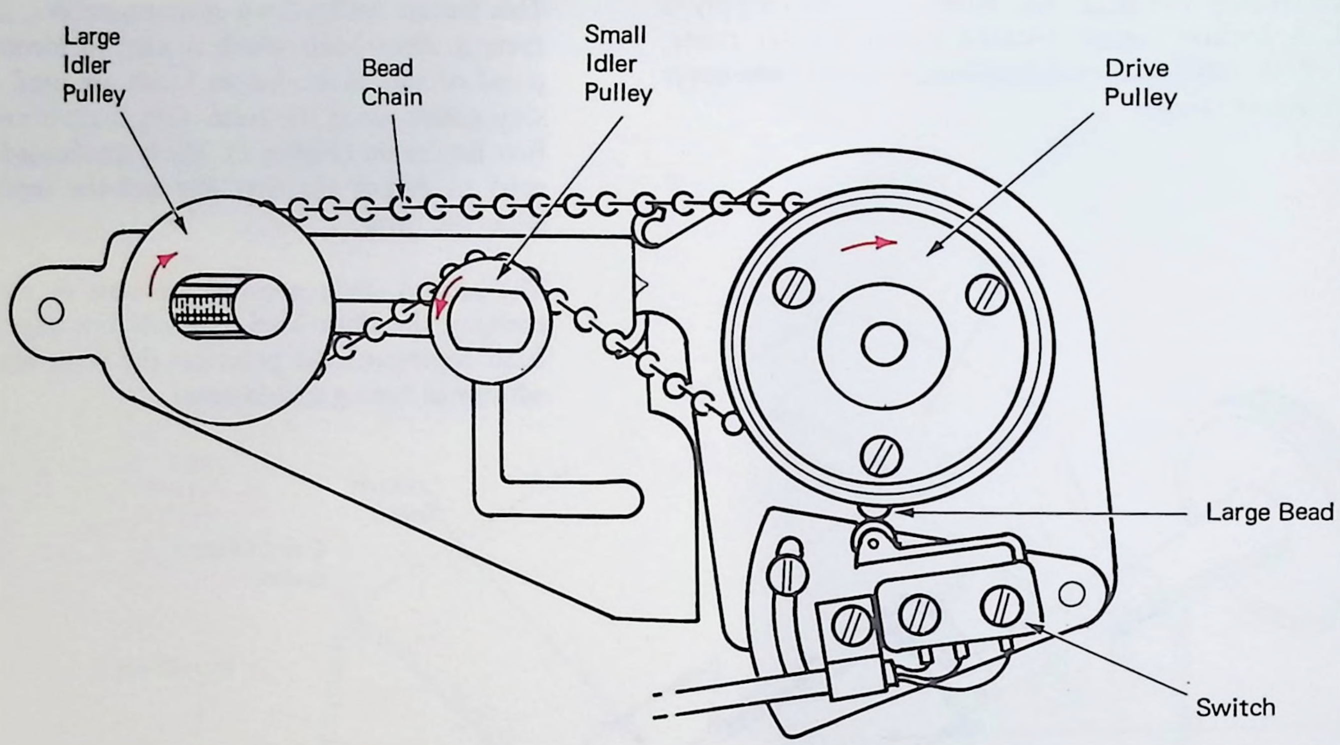


Figure 1 – Vertical Forms Control Feature

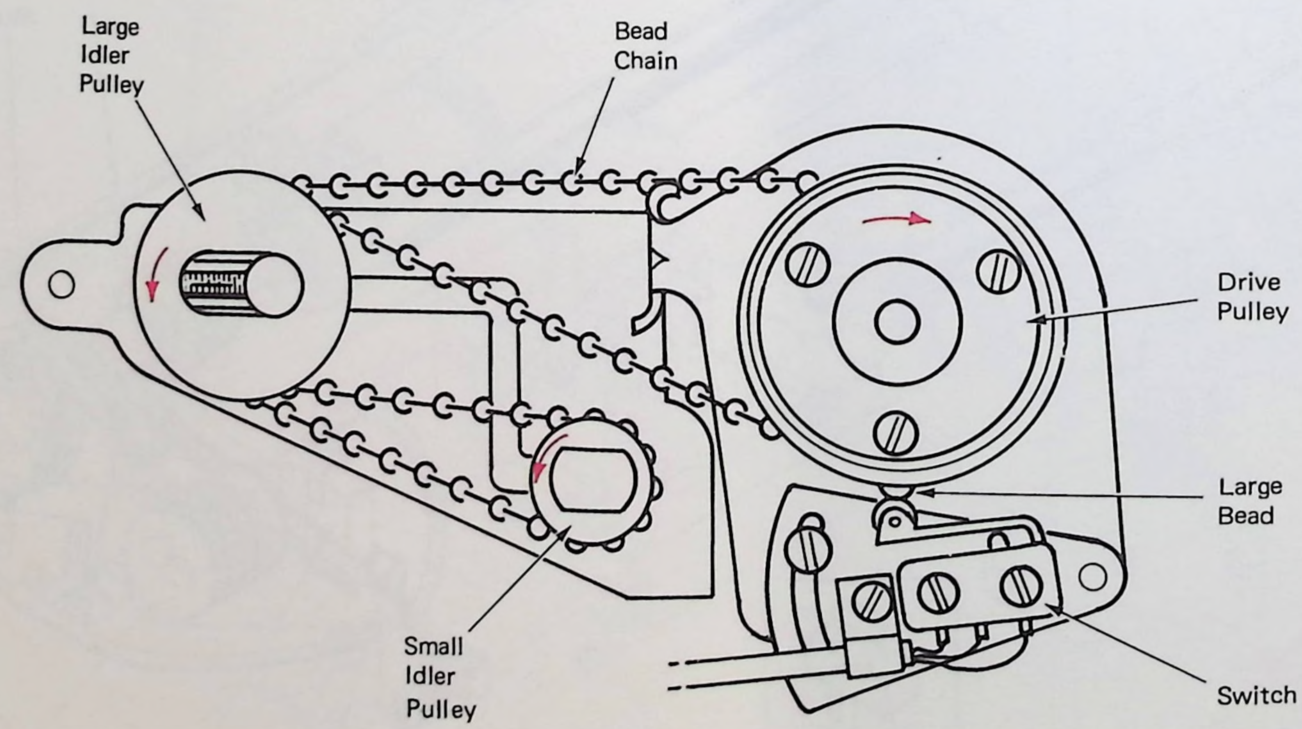
Each bead on either chain represents one line on a form, which must be spaced to six lines per inch (Figure 2). When the large bead on the start or overflow chain is detected, the electronics will cause the I/O to index until a large bead is detected on the stop chain indicating a new first line.

The beaded chains are available in various lengths to match the length of the forms being used. The chains are routed around a drive pulley and two idler pulleys. There are two methods of installing the bead chains. The length of the chain determines the correct method. If the chains are 12 inches or shorter, they should go over the small idler and around the large idler (Figure 2A). Chains longer than 12 inches go over and around the large idler then loop around the small idler (Figure 2B). The two idler pulleys have a wide range of adjustment to ensure proper tension on the various lengths of chain. The large pulley is adjustable front to rear and the small pulley is adjustable both front to rear and vertically.

Two small switches are mounted below the drive pulley in such a position that they will be transferred by the large beads on each chain as they pass. These switches indicate the position of the form to the electronics and control the required indexing operations.



(A – 12" Chain Or Shorter) (B – CHain



(B – Chains Longer Than 12")

Figure 2 – Forms Control Chains (Right Side View)

END OF FORMS SWITCH

The end-of-forms switch actuator extends through a slot in the center cover (Figure 3). As long as the end-of-forms switch actuator is held down by the form, the I/O can operate normally. If the end-of-form switch actuator is allowed to rise, because of the absence of a form, the switch will transfer completing a circuit to the electronics. This will stop any additional print out from the I/O.

The lockout plates slides left and right and can be positioned to hold down the end-of-form switch actuator when the forms control feature is not in use.

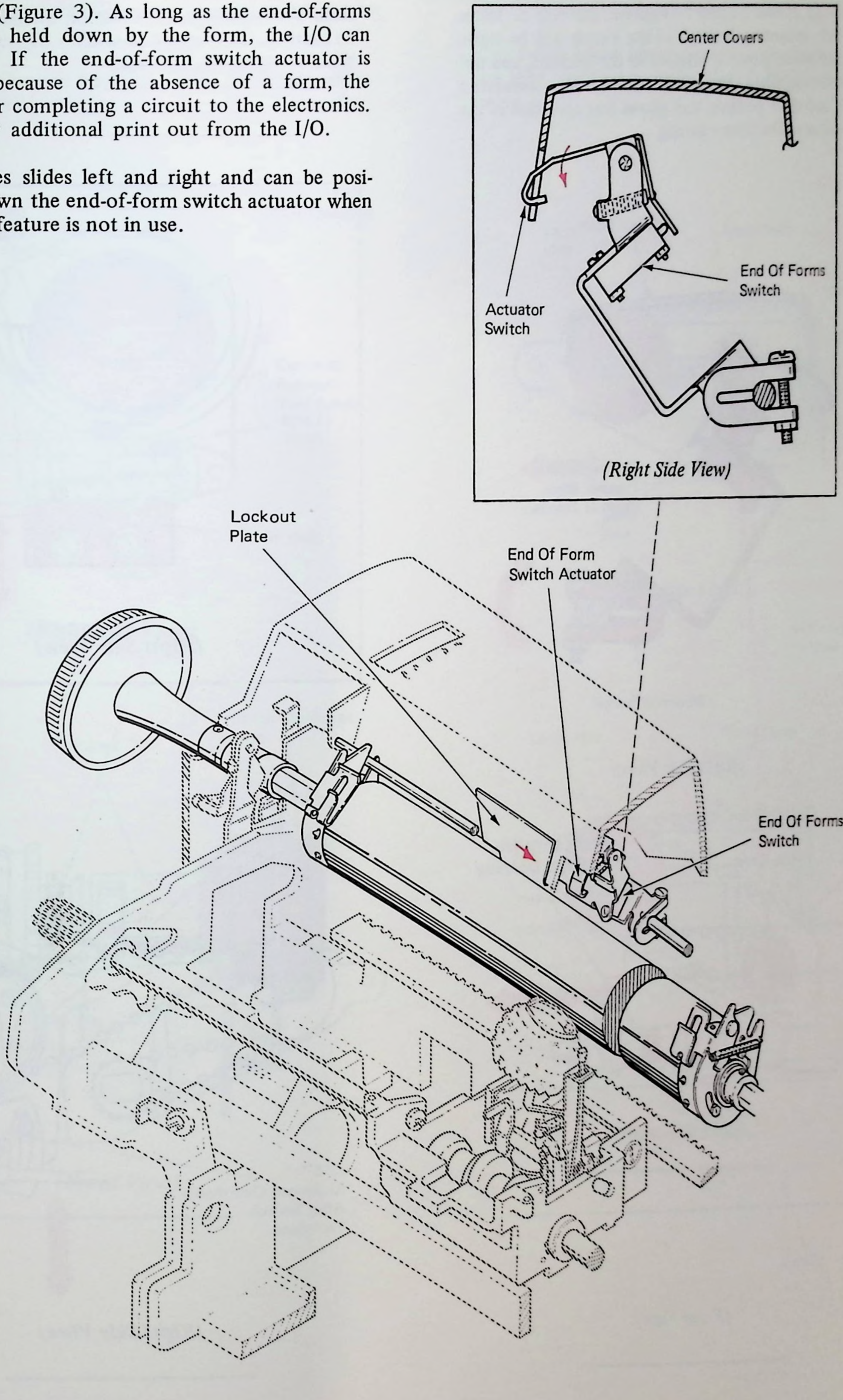
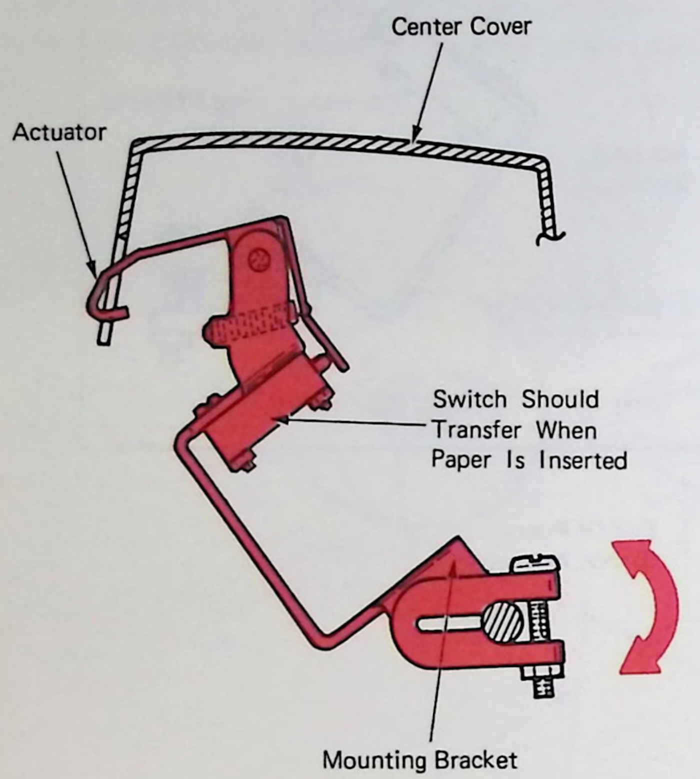
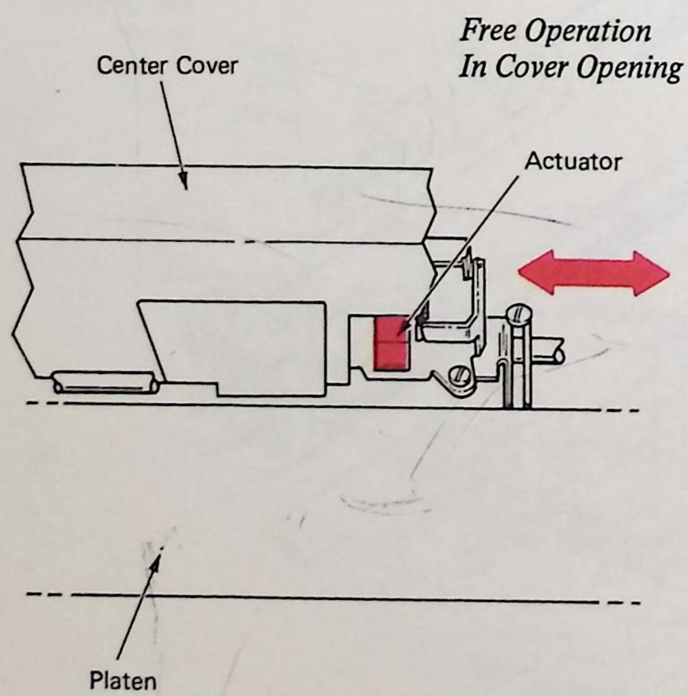


Figure 3 – End Of Forms Switch

1. *End of Forms Switch* – Position the end of forms switch mounting bracket so the switch will be transferred when paper is inserted in the machine, and not transferred when the paper is removed. Also, maintain a left and right position that allows free operation of the actuator in the cover opening.

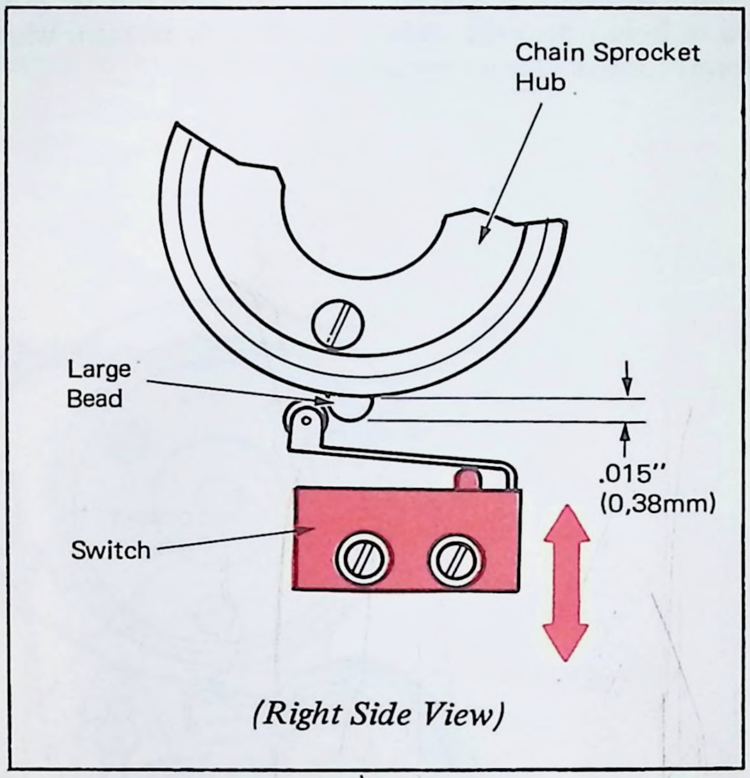


(Right Side View)

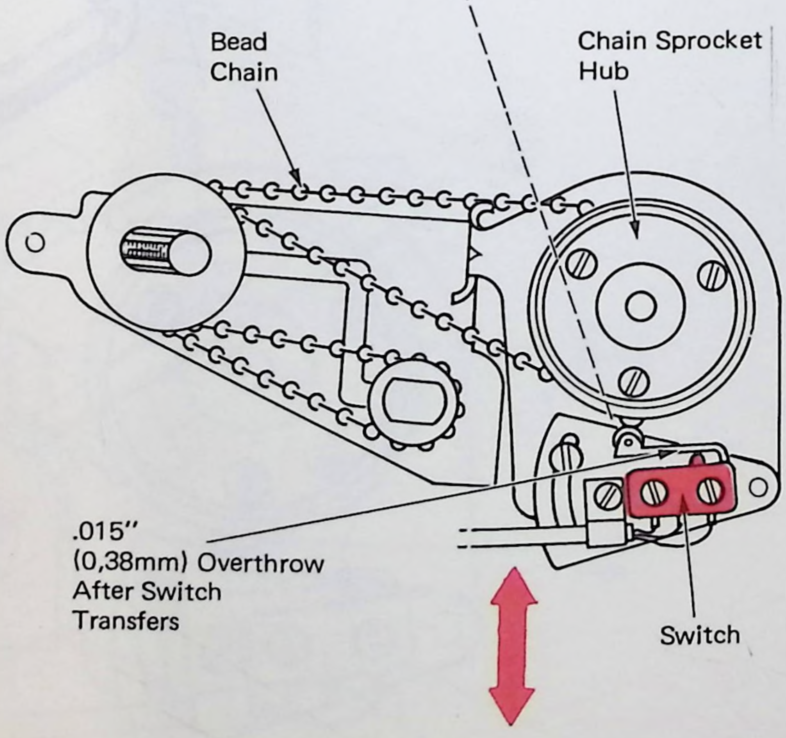


(Front View)

2. *Bead Chain Switches* – Position the bead chain switches so there is .015" overthrow after the switches have been transferred by a large bead.



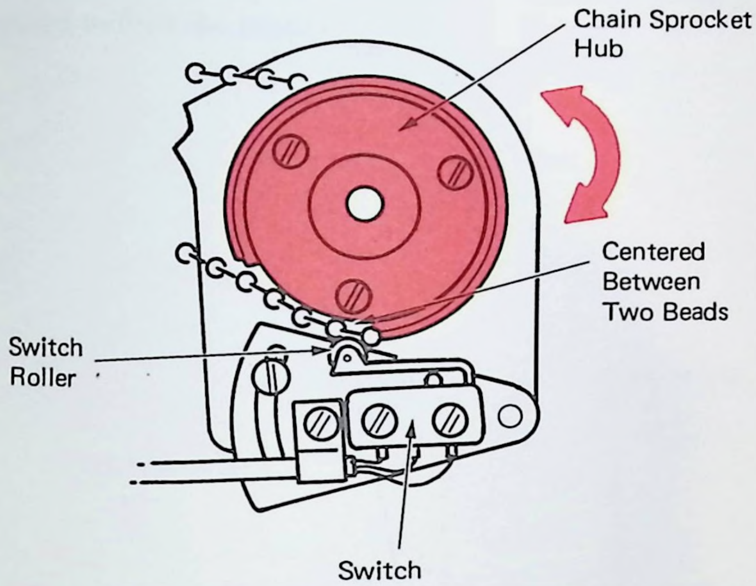
(Right Side View)



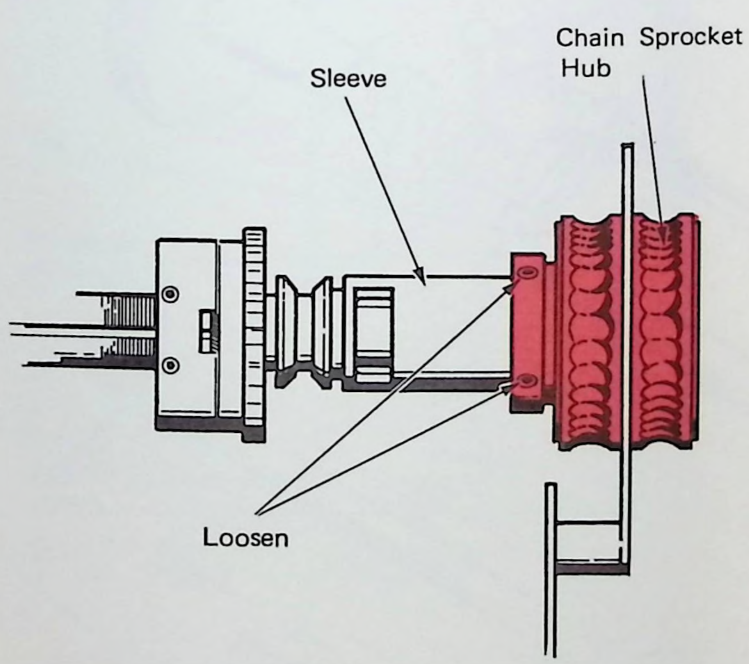
(Right Side View)

3. *Chain Position* – With the platen assembly in place and properly detented, rotate the chain sprocket hub on its sleeve until the switch rollers are centered between two small beads.

   NOTE: The hub must be fully to the left before tightening the hub setscrews.



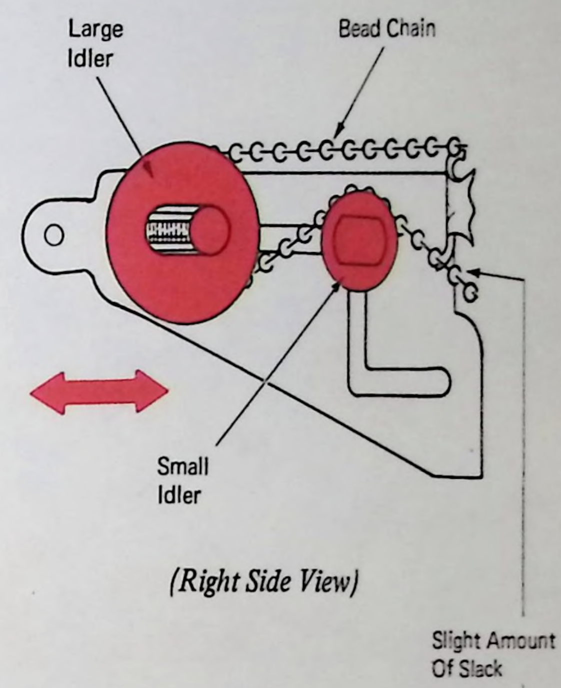
(Right Side View)



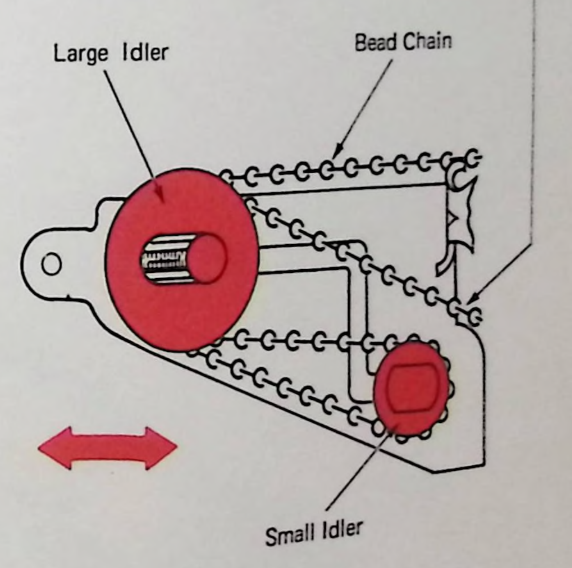
(Front View)

4. *Idler Adjustment* – Adjust the large idler so there is a slight amount of slack in both chains. The small idler should be used for a finer adjustment.

   CAUTION: Adjust for moderate tension. Chains which are tight could cause malfunctions in the index mechanism.



(Right Side View)



(Right Side View)

The purpose of the pin feed platen is to feed continuous forms (Figure 1). This is accomplished by pin wheel assemblies, on each end of the platen which engage perforations along the outside edges of the form. Platen cores come in lengths to accomodate most standard width forms.

During operation, the feed roll release lever should be forward in the released position because the feed rolls are not required to feed the paper.

The platen core is keyed to the right hand pin wheel body. The pin wheel body is setscrewed to a hexagon shaped platen shaft and rotates with the shaft whenever the platen is indexed. Each pin wheel body contains 9 pins, symetrically spaced around its surface. A cam mounts over the hub of the pin wheel and fits into a guide slot in each pin. Mounted onto the cam is a control plate which prevents the cam from rotating. The cam control plate is prevented from rotating by an anchor rod. The anchor rod extends the width of the platen and is mounted to each side of the center cover.

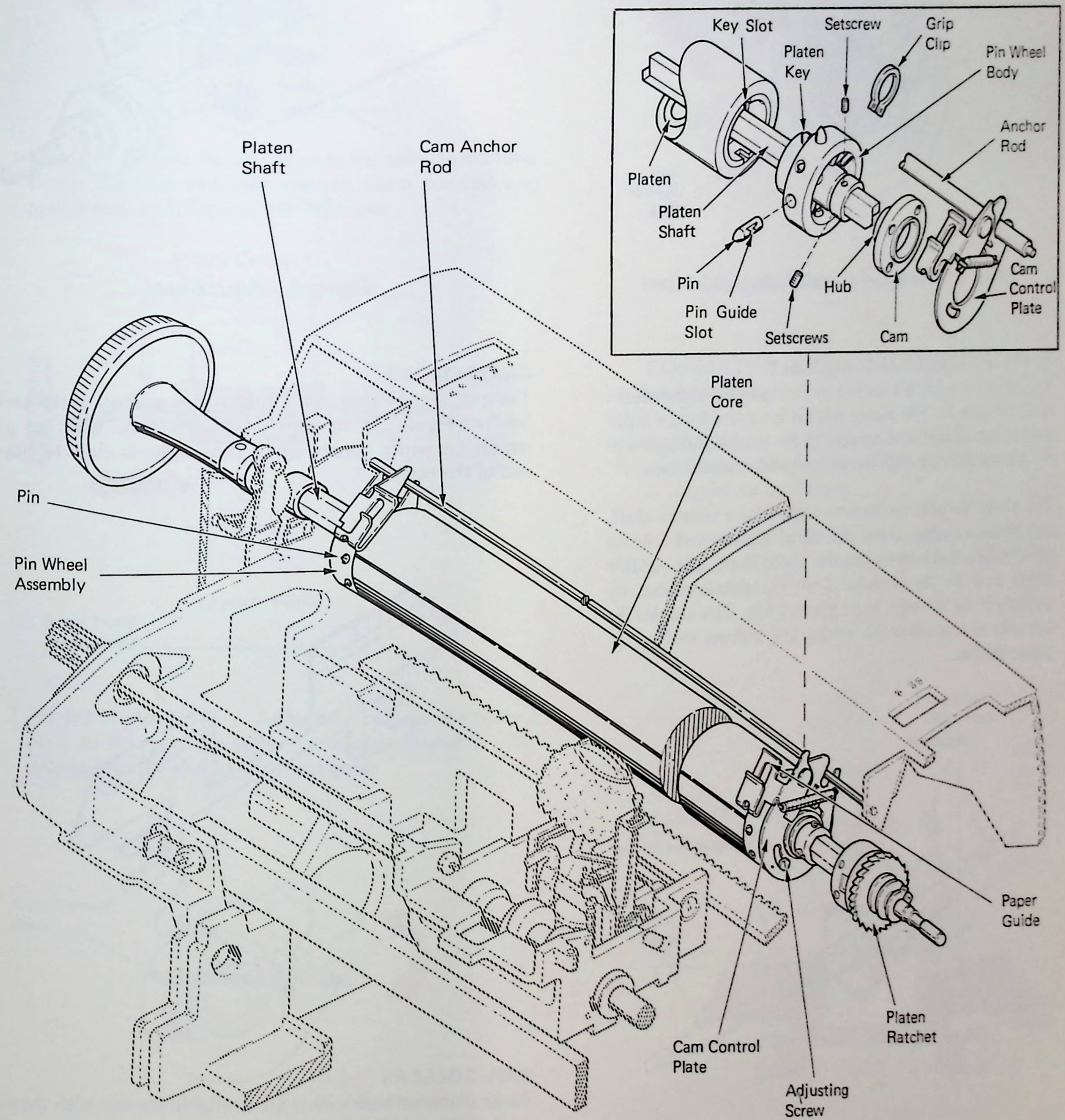


Figure 1 – Pin Feed Platen Assembly

PIN WHEEL OPERATION

As the pin wheel body turns, the pins move around the stationary cam and move in and out of their holes as they pass the high point of the cam. This means that the pins will exit and enter the pin wheel body at an exact radial position thus providing the motion necessary to feed forms through the typewriter (Figure 2). The point at which the pins reach their fully extended position can be varied by adjusting the position of the cam high point.

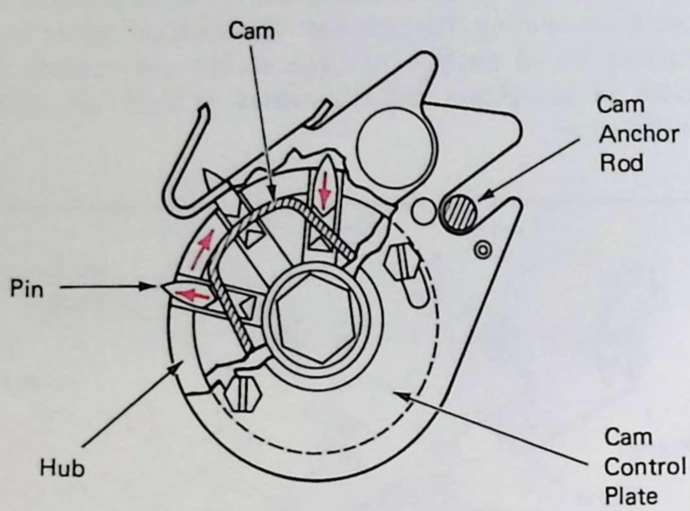


Figure 2 – Pin Wheel Assembly (Right Side View)

PLATEN RATCHET AND VARIABLE

The platen ratchet is attached to the right end of the platen shaft (Figure 3). The platen ratchet is rotated by the index mechanism. Rotational motion of the ratchet is coupled to the platen shaft through the platen variable mechanism.

The platen variable mechanism consists of a variable shaft, compression spring, driver pin, variable driver and a driver guide which is setscrewed to the platen shaft. The variable driver may be disconnected from the platen ratchet by pushing in on the right hand platen knob. This enables the operator to reposition the writing line without moving the platen ratchet.

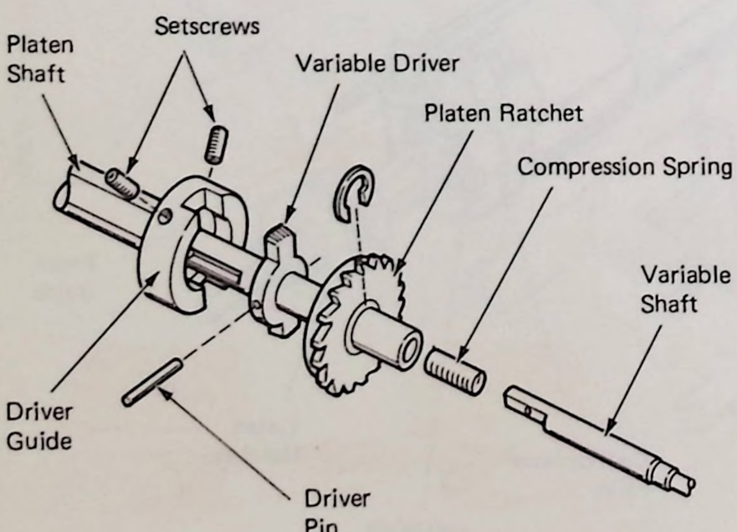


Figure 3 – Platen Ratchet And Variable

PAPER GUIDE

The paper guides are attached to the right and left cam control plates and are positioned in front of the extended pins to guide the paper (Figure 4). The paper guides may be pivoted upward to aid in positioning the form paper around the platen and over the extended pins.

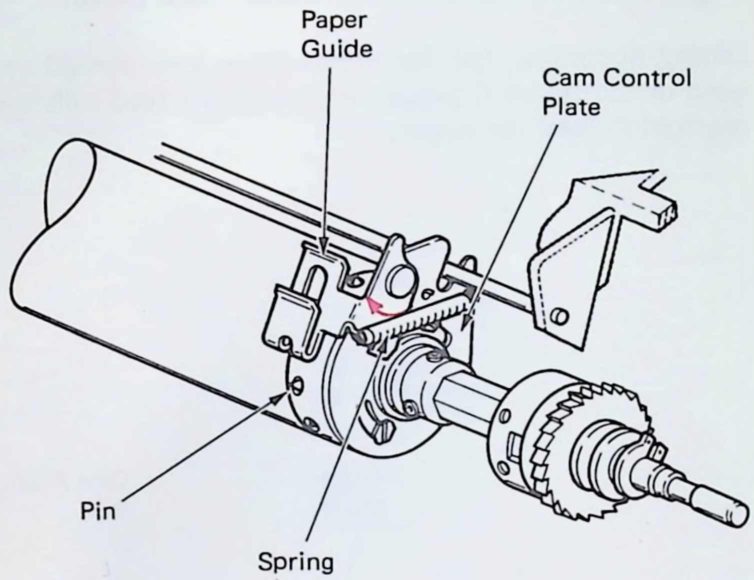


Figure 4 – Paper Guide

CARDHOLDER

The pin feed platen mechanism uses a short metal cardholder (Figure 5) to prevent interference with the pin wheels on paper guides when the carrier is close to either end of the platen.

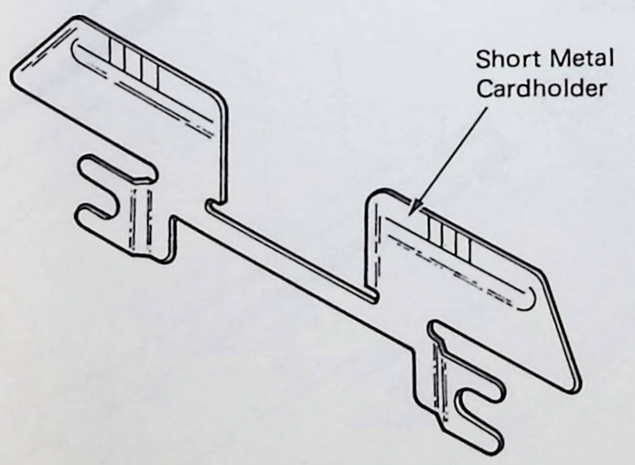
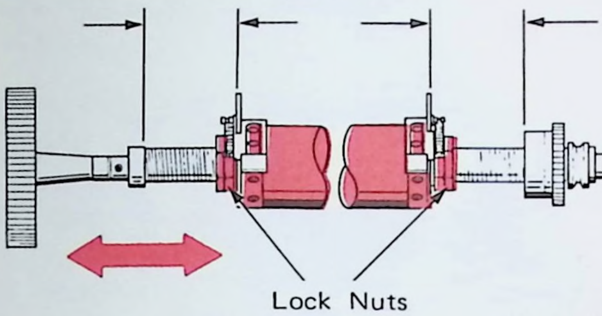


Figure 5 – Card Holder

BAIL ROLLERS

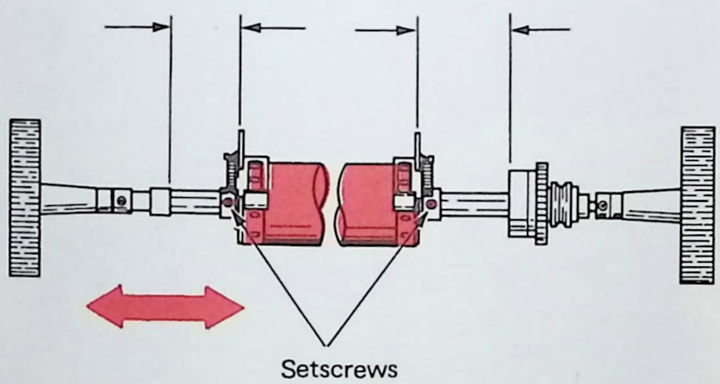
Large diameter bail rollers are available for use with the pin feed platen to aid in keeping the form paper flat against the platen surface.

1. Platen Core Lateral Position (Level 1) – Loosen the locknuts on both ends of the platen and center the core. Turn locknuts in and tighten.



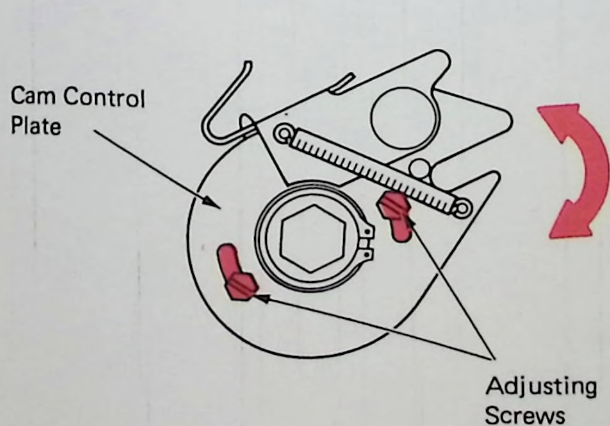
(Front View)

Level 2 – Loosen the setscrews in the pin wheel bodies. Center the core and slide the pin wheel assemblies up against each end. Tighten the setscrews.



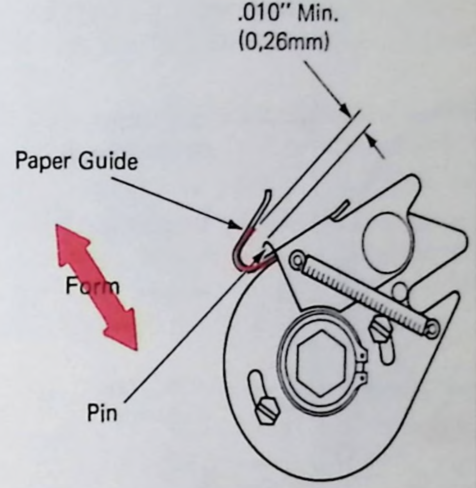
(Front View)

2. Pin Wheel Assembly – Adjust the cam on the control plate so the pins are fully extended immediately after passing into the slot of the form guide.



(Right Side View)

3. Paper Guide – Form the front extension on the paper guides front-to-rear for a minimum of .010" clearance between the underside of the guide and a fully extended pin as it passes under the guide.

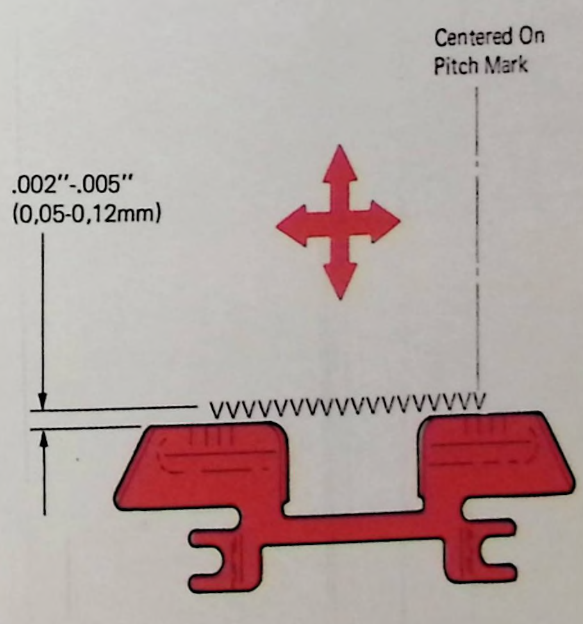


(Right Side View)

CARDHOLDER – Adjust the cardholder for the following conditions:

a. Position the cardholder up or down so the bottom of a row of typed V's is .002"-.005" above the top edge of the cardholder.

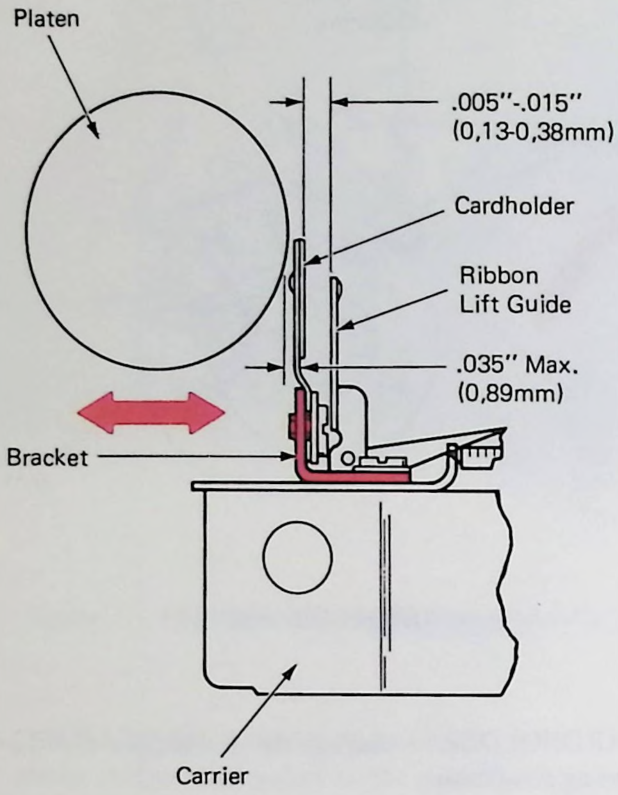
b. Position the cardholder left or right so the bottom of a typed V is centered on the pitch mark on the cardholder.



(Front View)

c. Position the cardholder mounting brackets front to rear for a clearance of .005"-.015" between the cardholder and the ribbon lift guides.

NOTE: The cardholder should not exceed .035" from the platen.



(Left Side View)

This section discusses electrical specifications; contact and magnet operations; and Correspondence, BCD (Binary Coded Decimal) and MT/ST circuitry. All contact and magnet operations are covered on an individual basis in their proper sections. This section covers how the contacts and magnets compliment one another to function properly with an electronic device.

GENERAL CONTACT SPECIFICATIONS

For reliable operation, all contacts used in the I/O *must* be operated within 10 to 300 ma. (milliamperes) at 10 to 48 volts. Additional considerations must be given to the operational transmit contacts which are wire type contacts. These considerations are: 200 to 300 ma. only if operated in a steady, non-switching state, 40 to 200 ma. if adequately arc suppressed, and 10 to 40 ma. without arc suppression. The use of less than 10 ma. or 10 volts is *not* recommended.

One to five milliseconds bounce may be present at the make and break of any contact. Due to the "wiping" action of the contacts, during the bounce free time of a cycle, discontinuities of up to 200 microseconds may be present. It is therefore highly recommended, when connected to a solid state control device, that the control device incorporate the use of Bi-stable switches. This will isolate the fast acting circuitry of the control device from any I/O contact bounce or discontinuities.

CONTACT OPERATION

The I/O contacts will be discussed in groups to show their relationship to one another and to an electronic device.

Feedback Contacts – Output Mode – The purpose of C2 through C6 is to act as circuit breakers to provide gating signals to the electronic device during output operations. This provides maximum output speed with maximum reliability.

A closed circuit through the N/C points should indicate to the electronics that one of two conditions exist: First, the I/O is at rest and therefore, any output instruction can be initiated. Second, the I/O is performing an operation and the N/C point has remade indicating the operation is near completion. Again, any output instruction can be initiated.

An open circuit caused by the N/C points being open, should indicate to the electronic device that the I/O is performing an operation and therefore cannot receive another output instruction. The N/C point opening can also be an instruction to drop the voltage to the magnet(s) which initiated the function that opened the N/C point.

Use of the "C" contacts in this manner is usually referred to as a closed loop operation.

Interlock Contacts – The operation of all functions except tab and carrier return are near completion when their respective "C" N/C point remakes. Due to the distance the carrier may have to travel during carrier return and tab, the "C" contacts used with these functions will be at rest before the carrier has come to rest. Therefore, when the carrier return mechanism is latched into operation, the carrier return interlock contact is also held operated until the carrier is at rest again. This interlock contact instructs the electronic device to hold the next output operation until the carrier has come to its rest position at the left margin. The tab interlock functions identically during a tabulation.

Margin Control Contacts – The margin control contacts are used by an electronic device to identify line length. The zone contacts are used to indicate the carrier is approximately one inch from the right margin stop. The last column (end of line) contacts are used to indicate the carrier has reached the right margin stop. Those contacts are covered in detail in the Margin Control Section.

Output Mode – Recommended Operation – The I/O is designed for operation in a "Closed Loop" Mode. Other common industry terms synonymous with "Closed Loop" describe operation as being on a "Ready-Busy" or "Demand-Response" basis. Maximum speed, reliability and longevity is possible only with this mode of operation.

In the Closed Loop mode, information from the control device is released to the I/O only during "Ready" intervals defined by the I/O feedback and interlock contacts (Figure 1). Under these conditions control device commands are released relative to I/O cam shaft degrees of rotation rather than relative to time. With this approach, the TIME required (by the I/O) to complete any one individual operation is not a factor in reliable operation.

Feedback contacts are timed to permit initiation of a "next cycle" prior to the end of the "current cycle". This avoids completely stopping the machine between cycles and ensures optimum hardware longevity by reducing the frequency of engagement and disengagement (under full power) of the I/O mechanical clutches.

Figure 1 illustrates, from an instructional standpoint, sources of certain essential signals which can be defined by the I/O feedback and interlock contacts. True conditions of "Ready", "Busy", etc. exist when a Logical "1" appears at the output of a logic block. A Logical "1" is generated when a logic block input is conditioned by I/O contact closure between the block and power common. Comments are as follows:

READY (R) – Defines a period of time when I/O magnets (print or functional) are to be addressed. The magnet(s) addressed should be held for the full duration of the "R" period. The "R" condition occurs when normally closed I/O contacts C2, C3, C4, C5, C6 and Carrier Return (C.R.) and Tab interlocks are all closed.

BUSY (B) – Defines a period of time during which no I/O magnets are to be addressed. This signal is also commonly used to request (from the control device) the next operation. A "B" condition exists when any one of the normally open (N/O) I/O contacts C2, C3, C4, C5, C6 or C.R. or Tab interlocks are closed.

END OF LINE (E) – Indicates that the end of the writing line has been reached. When the "E" condition is sensed, a carrier return command should be initiated and all other operations suppressed until completion of a carrier return is indicated by appearance of an "R" condition.

NOTE: In a normal programmed operation, typical to output applications, the right margin is approached during either a print or space operation. It is possible to tabulate through the right margin. Under this condition, "E" will not be generated unless the make times of the normally open C5, and End of Line contacts should accidentally coincide. Provisions should be made to avoid this condition.

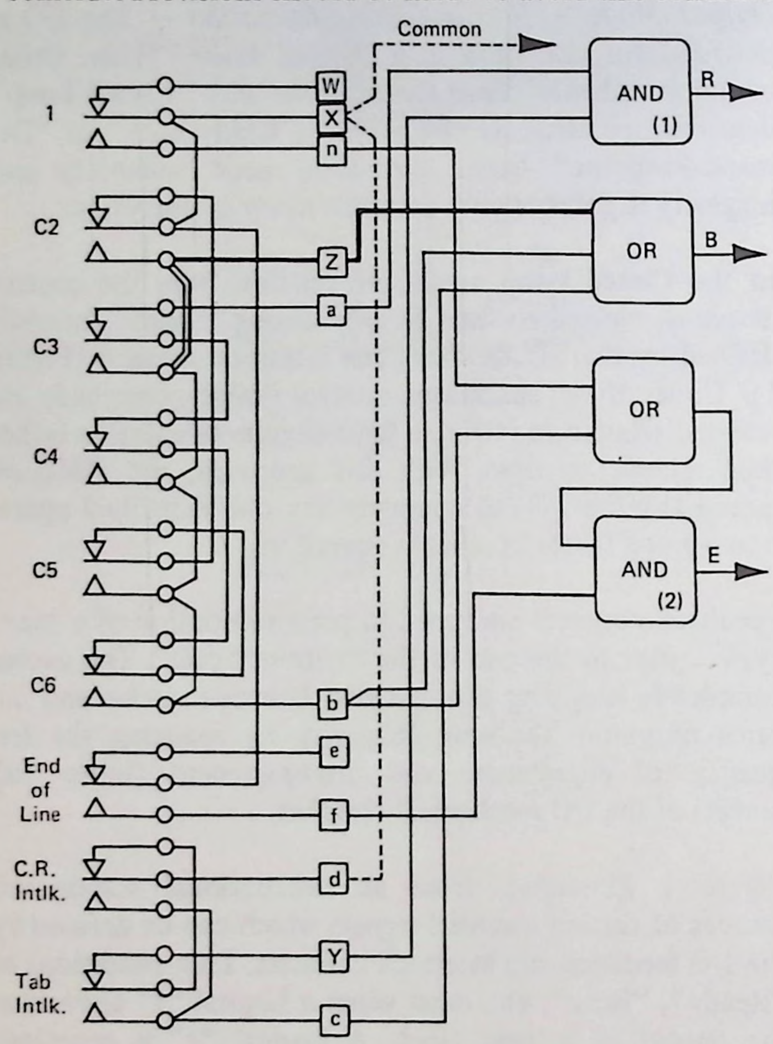


Figure 1 – Output Mode

NOTES:
1. Alphabetic characters in squares (X , a , etc.) are typewriter connector terminals. Detail to the left of these terminals is internal typewriter wiring and contacts.
2. A heavy line (▬) indicates connections on machines with BCD configuration.
3. A double line (═) indicates connections on machines with correspondence wiring.
4. The dotted line (----) is external "common" wiring added for clarity.
5. Output "R" from AND BLOCK (1) illustrates a "Ready" signal source.
6. Output "B" from OR BLOCK illustrates a "Busy" signal source.
7. Output "E" from AND BLOCK (2) illustrates source of "End of Line" signal.

Output Mode – Operation Not Recommended – A mode of operation where commands (control device to I/O) are released on a timed basis is not recommended. Such an approach is generally referred to as an "Open-Loop" or "Synchronous" mode of operation. As previously described, the I/O should receive commands relative to machine degrees. Reliable operation CANNOT be guaranteed when an OPEN LOOP mode of operation is employed.

Any approach which does not provide total interlocking between control device and I/O must presume the ability to synchronize the I/O at line speed. Further, for reliable operation, this requires that the time required to complete each individual machine cycle be an unvarying constant. I/O cycle times are NOMINAL and can be maintained, as an average, in a Closed Loop mode of operation; however, the time required for individual machine cycles will vary and, consequently, is not absolute. For this reason, occasional loss of a machine cycle is inherent in an Open Loop mode of operation.

Feedback Contacts – Input Mode – During an input operation, the purpose of C1 and C3 through C6 is to gate the sampling of the transmit contacts. The N/O contacts should make after the transmit contacts have made and open before the transmit contacts open. This control of the transmit contacts provides a condition where the transmit contacts never transfer while voltage is applied to them. Therefore, longer life and greater reliability is obtained by the transmit contacts.

Mode Contacts – The mode contacts are used in mechanisms that can rest in one of two conditions while other output operations are occurring. Shift, keyboard and red ribbon shift all operate mode contacts when operated from one condition to the other. The contacts can be sampled, at any time, by the electronic device, to identify which condition these mechanisms are in.

Transmit Contacts – Transmit contacts serve to identıry, to an electronic device, what operation is being performed in the I/O. There are three groups of contacts identified as follows:

1. Selection transmit contacts – controlled by the character selection mechanism.

2. Operational transmit contacts – controlled by tab, spacebar, backspace, carrier return, and index.

3. Shift transmit contacts – controlled by the shift mechanism.

The circuit configurations used with these contacts are generally described as correspondence or BCD circuitry. The theory of these configurations will be discussed later in this section.

Parity Contacts – The parity contacts provide a method of checking the selection transmit contacts to ensure a valid character is being transmitted.

The contacts are located in the same assembly as the selection transmit contacts (Figure 2). The upper bank of contacts are the parity contacts. The contacts will be operated by the same actuator that operates the transmit contacts when a selector latch is pulled down by the character selection mechanism. This action is more fully discussed in the Character Selection (input) section of this manual.

The parity check does not ensure that the correct character has been printed, only that the correct number of selector latches are pulled down. During input, the check latch is pulled down anytime the number of latches required for character selection is even. This will ensure, under proper operation, that an odd number of contacts are always transferred. If a mechanical failure occurs, an unwanted latch may be pulled down, or a desired latch may pop out from under the bail. Since an odd number of contacts should always be transferred, failures of this type can be recognized immediately.

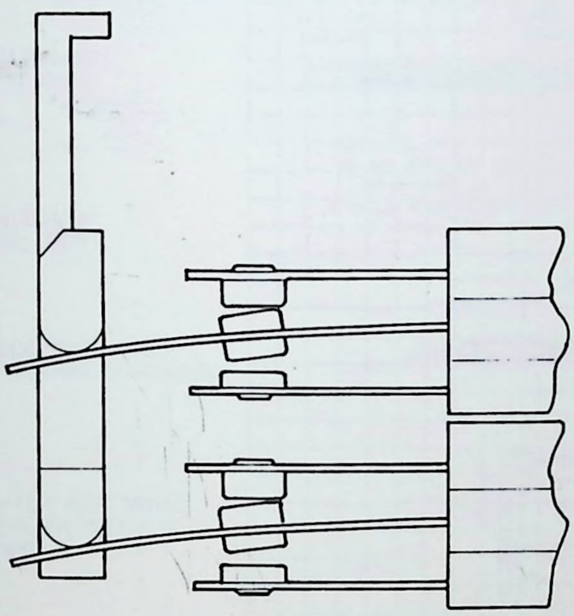


Figure 2 – Parity (Left Side View)

Parity Circuit – For "odd parity", the parity circuit is wired to always have a voltage at pin "p" if an odd number of latches have been transferred (Figure 3). If a failure occurs an even number of contacts will be transferred, and no voltage will be present at pin "p". This failure can be identified by the logic of the electronic device by monitoring this voltage level.

For "even parity", the connection from a 1 to the T2 N/O point would be moved to the T2 N/C point. Therefore, the voltage level at pin "p" would only be present if an *even* number of contacts were transferred. The design of the electronic device determines whether the "even" or "odd" parity system is used.

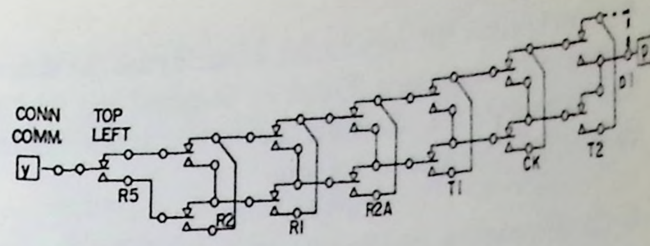


Figure 3 – Parity Circuit

MAGNET COIL SPECIFICATIONS

Magnet coils may be found in both 24 and 48 volt operating ranges (Figure 4). The character selection, operational, and lower case shift magnets will operate within 10 milliseconds at their rated voltages. The upper case magnet, red ribbon shift magnet, and keyboard lock solenoid will operate within 12 milliseconds when operated at their rated voltage. The chart below gives the resistance and current ratings of the various magnets. Operation can be maintained at +10% of rated voltage, however, the operating speeds will vary.

NOTE: Magnet and triplink adjustments will affect pick time.

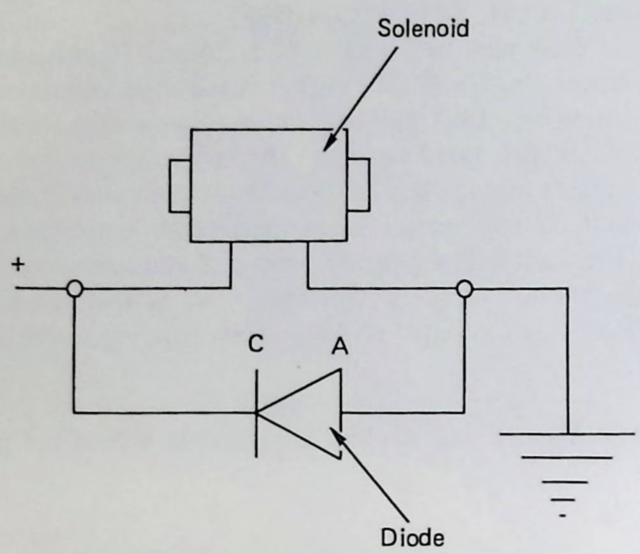
Where Used	Rated†† Voltage	Resistance in Ohms Low	Rated	High	Max. mA*
Keyboard† Lock	48	329	358	397	146
	24	100	105	110	240
Upper Case Shift**	48	221	240	259	217
	24	62	65	68	387
One Magnet† Ribbon Shift	48	345	395	455	139
	24	125	137	150	192
All Others	48	432	475	518	111
	24	122	128	133	197

*Theoretical maximum current (in Milliamperes) at rated voltage – computed as ratio of rated voltage to low resistance.
**Also red magnet of Two Magnet ribbon shift.
†100% Duty Cycle. The Duty Cycle of all other magnets is described as "sufficient to provide continuous machine operation when magnet pulses are gated by the Feedback and Interlock Contacts."

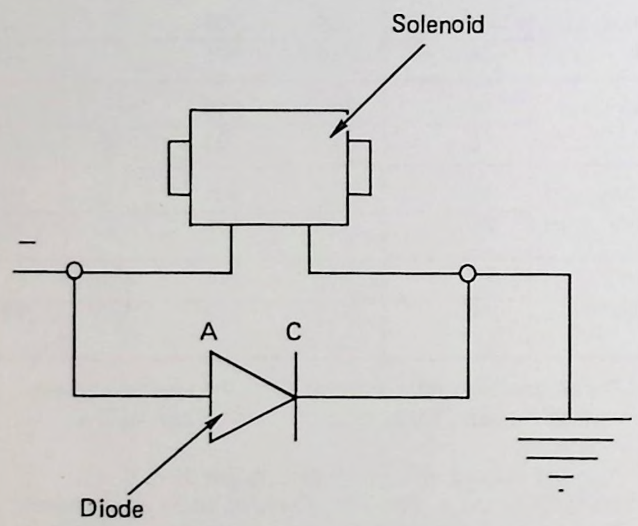
Figure 4 – Magnet Coil Specifications

Art Suppression – All magnets and solenoids use the diode method of arc suppression (Figure 5). Standard I/O wiring used negative ground, therefore, the anodes of the diodes used for arc suppression are common.

If the I/O magnets are operated with a positive ground configuration, then the arc suppression diodes must be common cathode.



(Negative Ground)



(Positive Ground)

Figure 5 – Arc Suppression

TIMING CHARTS

Charts on the following pages provide theoretical, mechanical design objectives. When using the charts, the following considerations must be kept in mind:

1. Machine cycle times for all printed characters will not be identical.

2. Slight timing variances will be noted between the two lobes of 180 degree cams.

3. It is not practical to "spec-check" machine timing against the charts, while hand cycling with a hand turning wheel and observing readings on a test-lite or ohmmeter. The turning wheel does not provide sufficient vernier control for accuracy. Experience has proven that different readings will, almost invariable be taken under either of the following conditions:

   a. Two observers test the same machine.

   b. One observer tests the same machine twice. Experience has shown that timing adjustments made by a technician having average technical proficiency are adequate.

NOTE: Review the output mode, recommended and not recommended, operations previously discussed in this section.

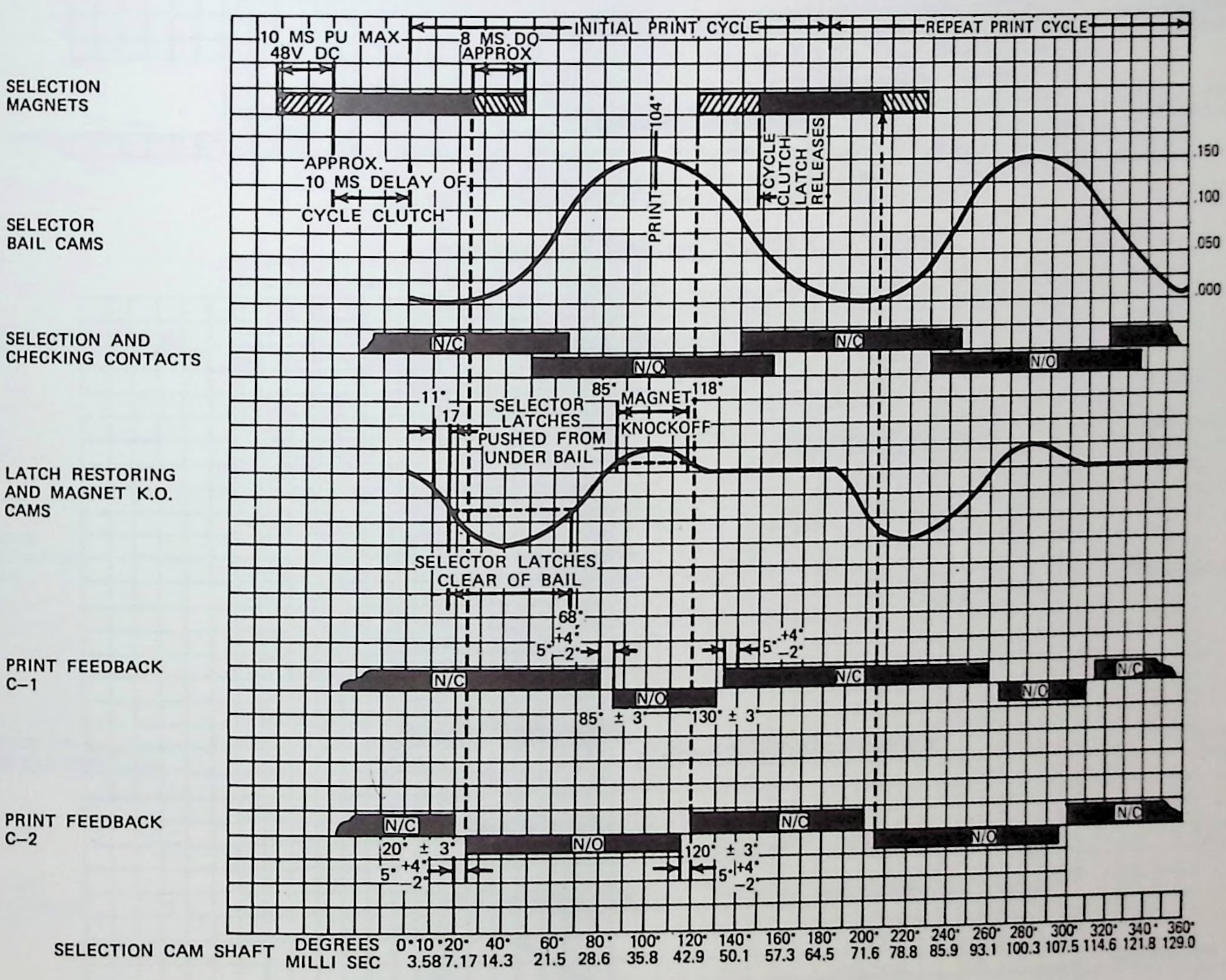


Figure 6 – C1, C2 Printing Selection Timing Chart

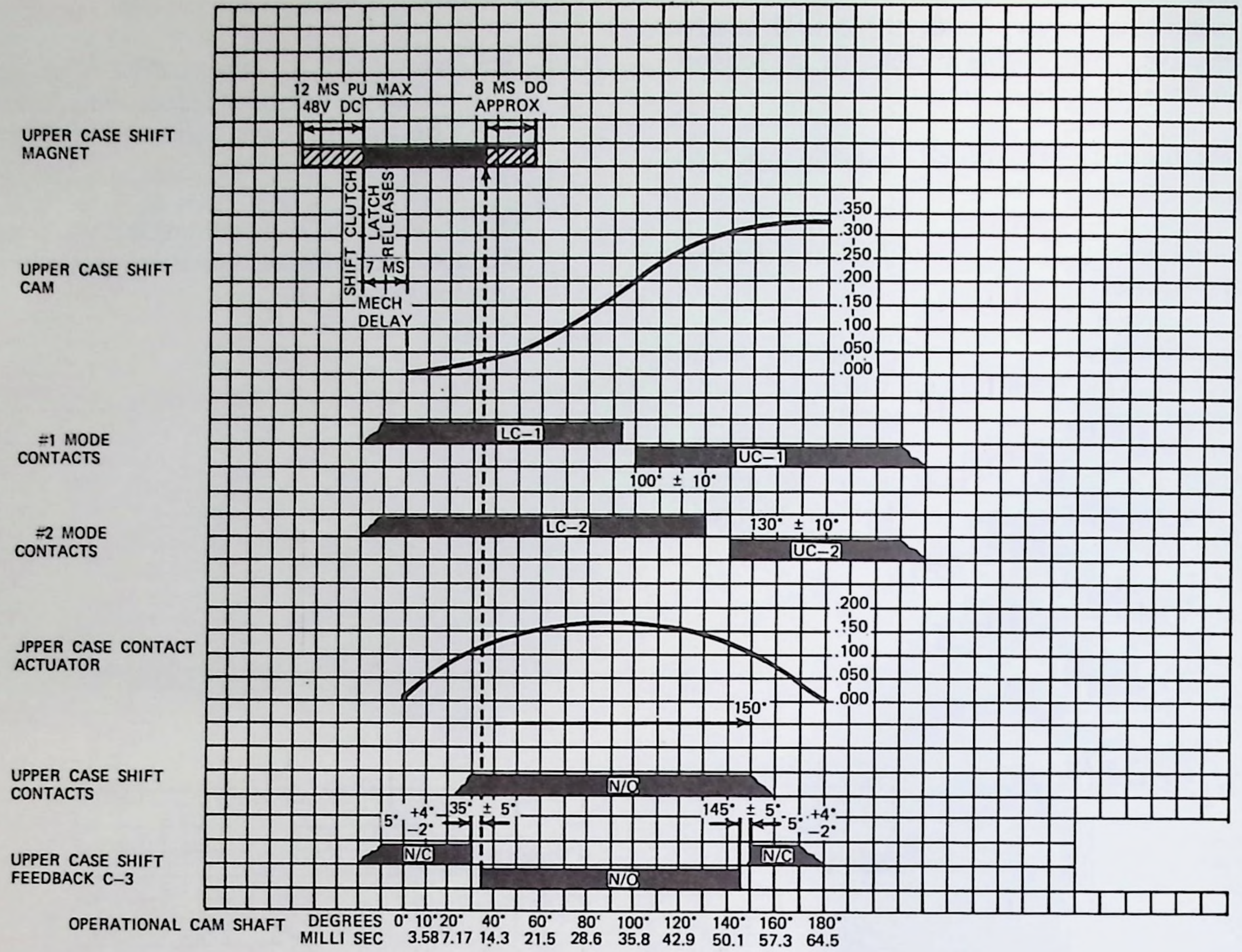


Figure 7 – C3 Upper Case Shift Timing Chart

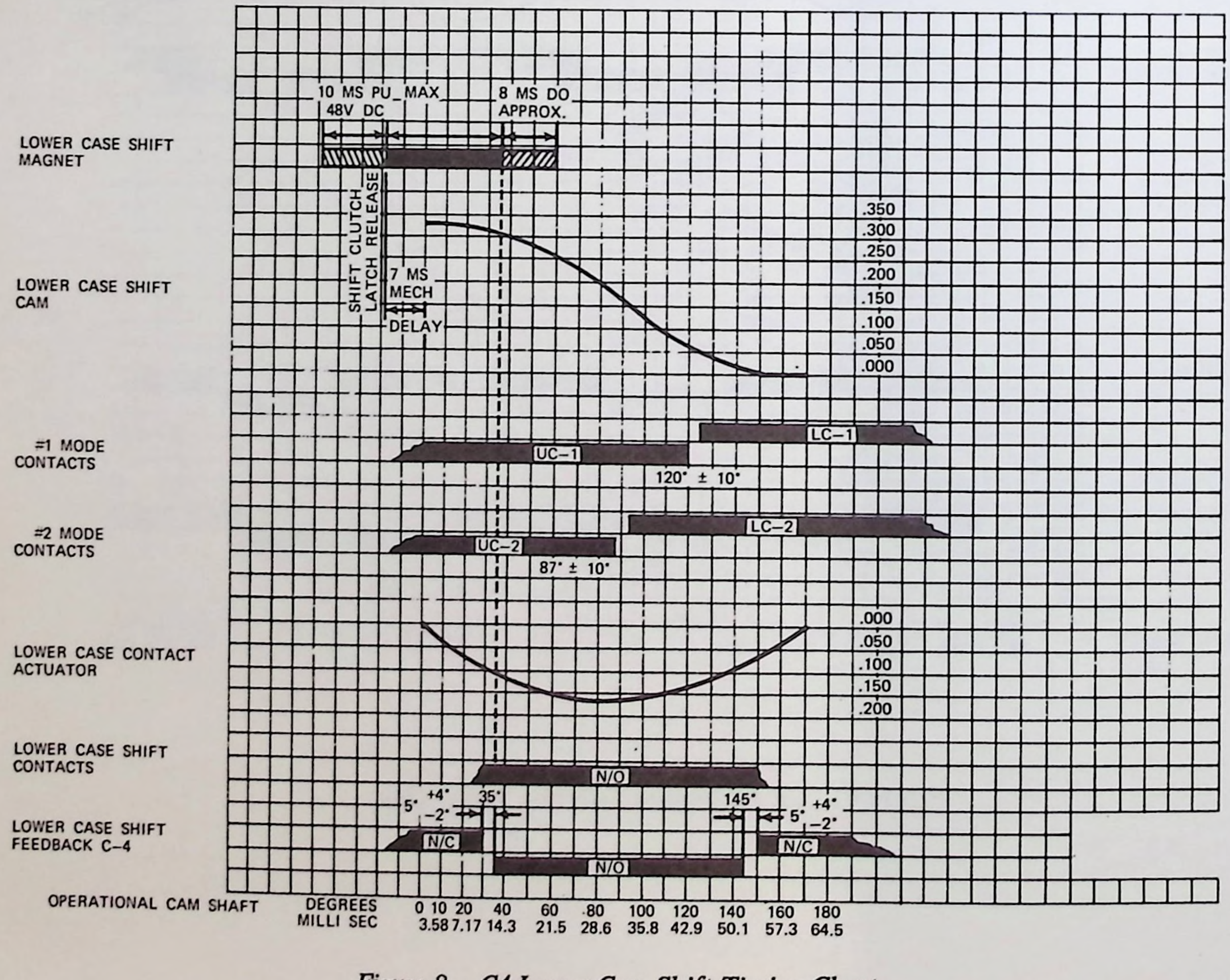


Figure 8 – C4 Lower Case Shift Timing Chart

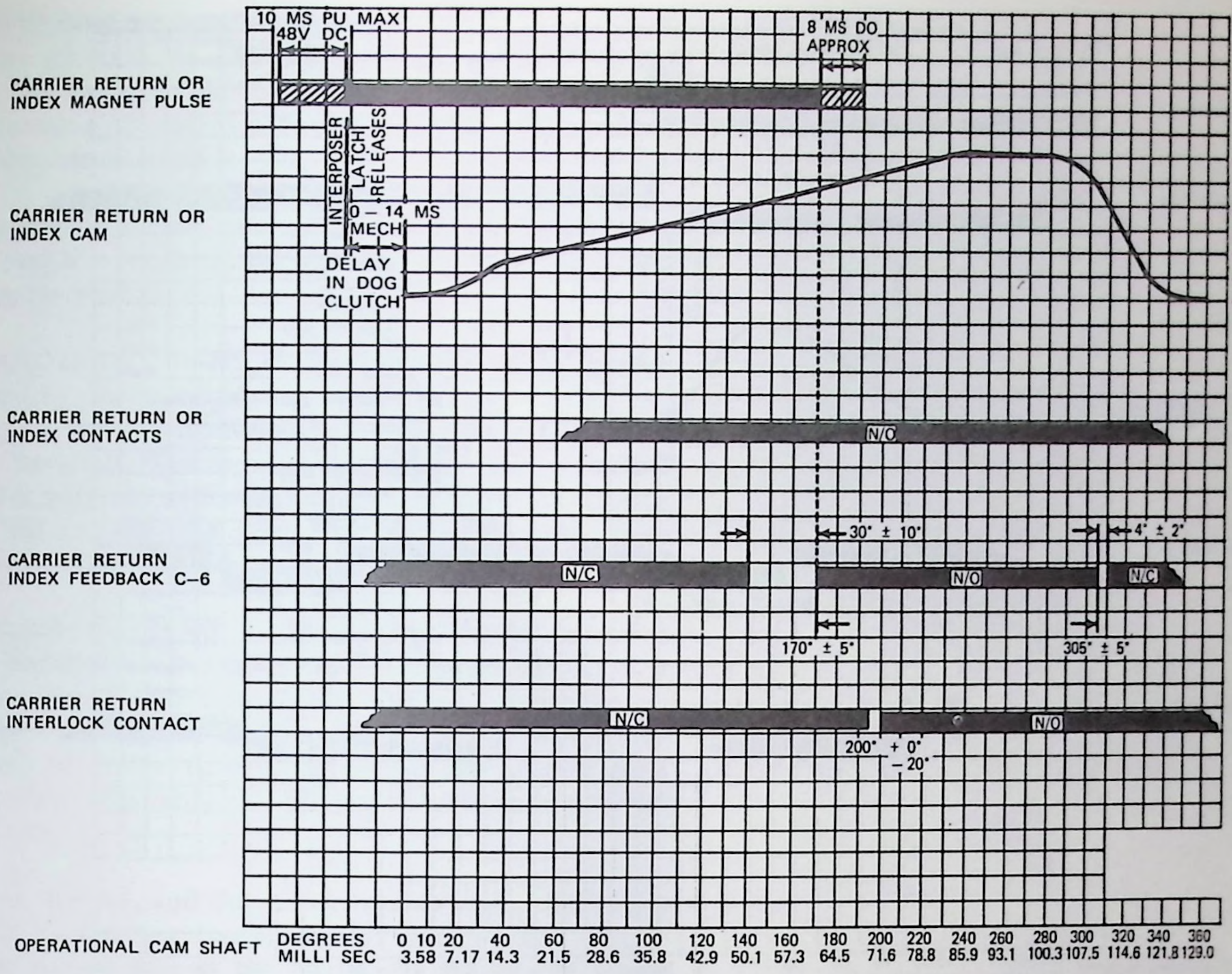


Figure 9 – C6 Carrier Return & Index Timing Chart

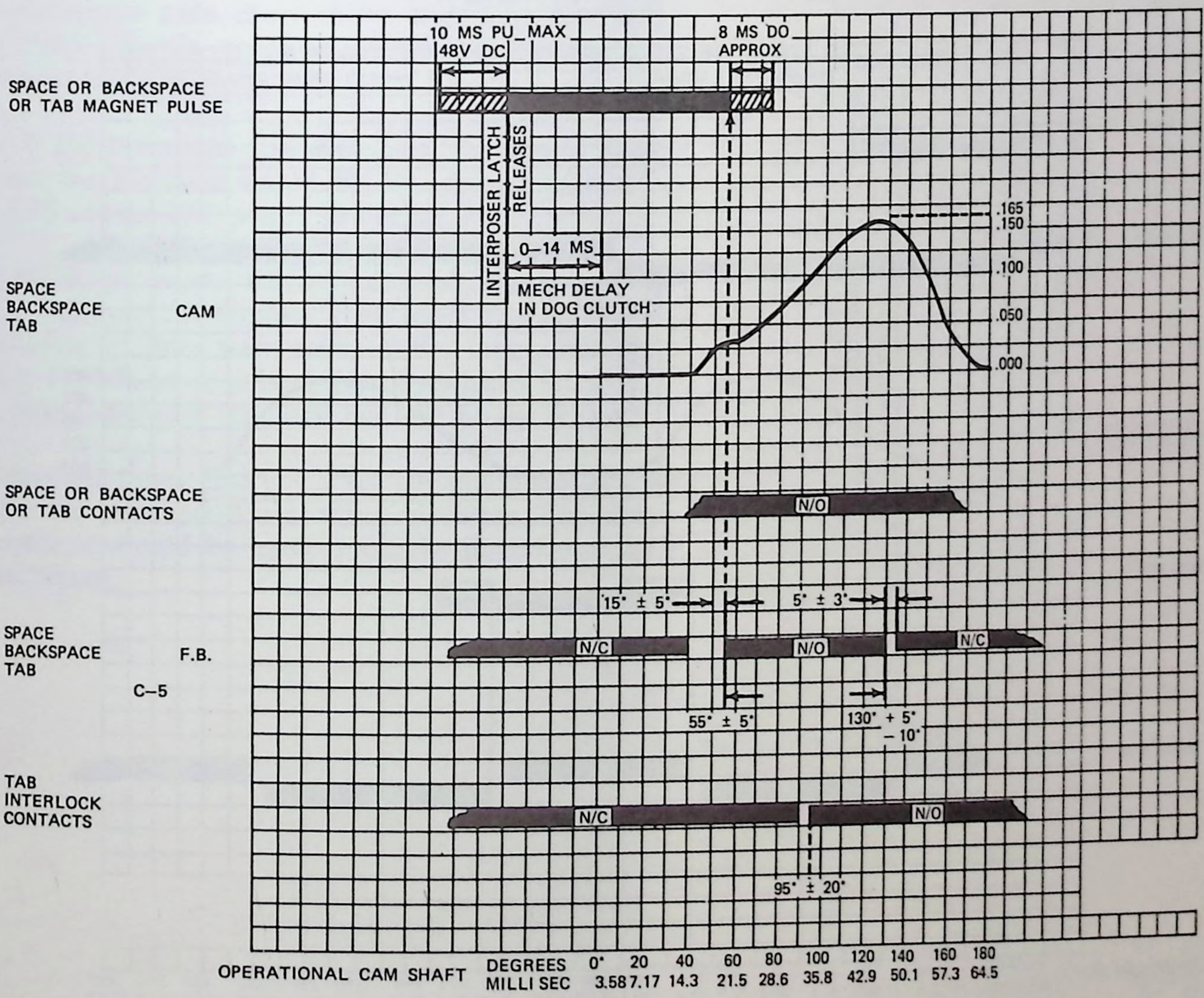


Figure 10 – C5 Space, Backspace & Tab Timing Chart

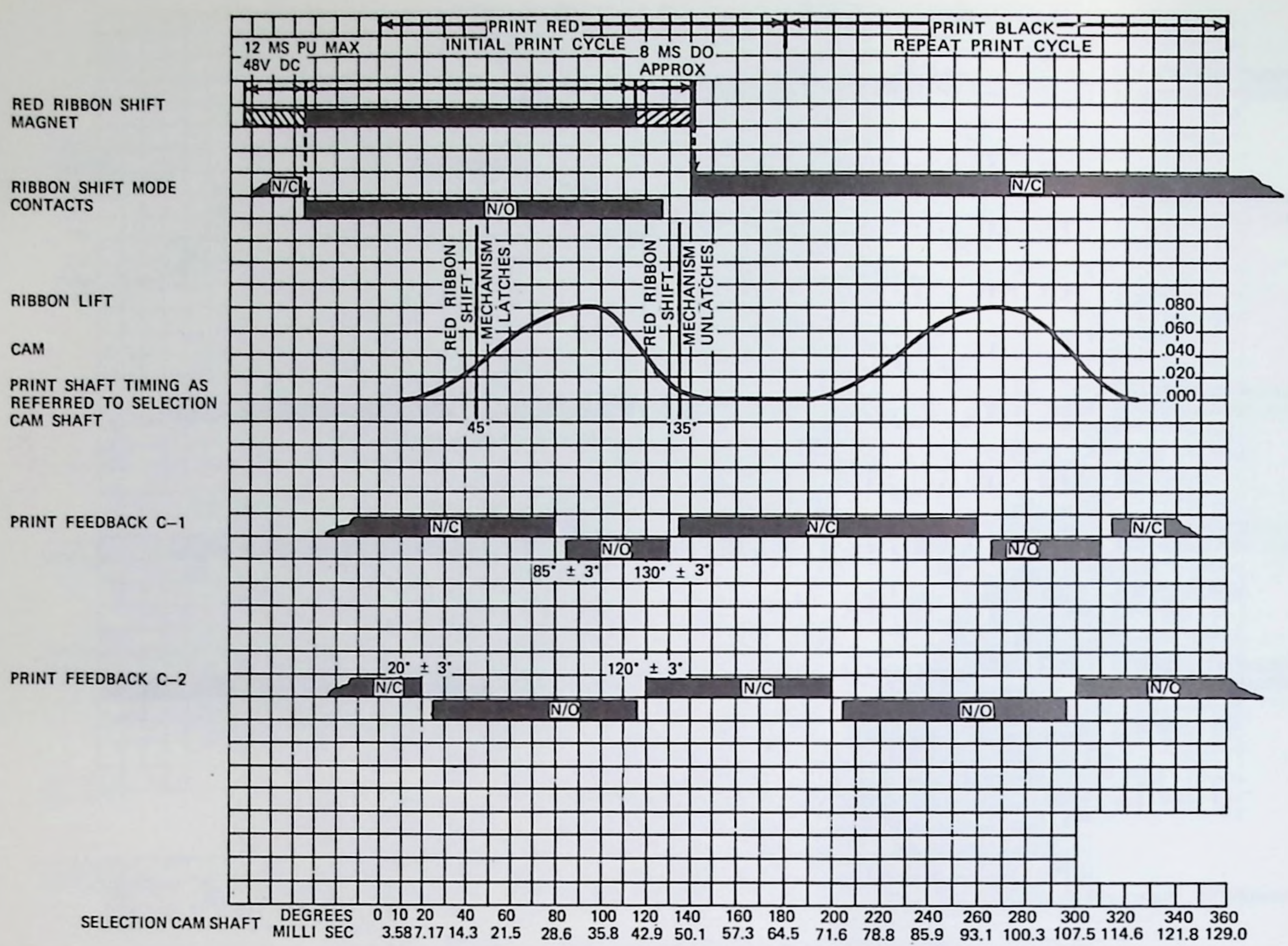


Figure 11 – One Magnet Red Ribbon Shift Timing Chart

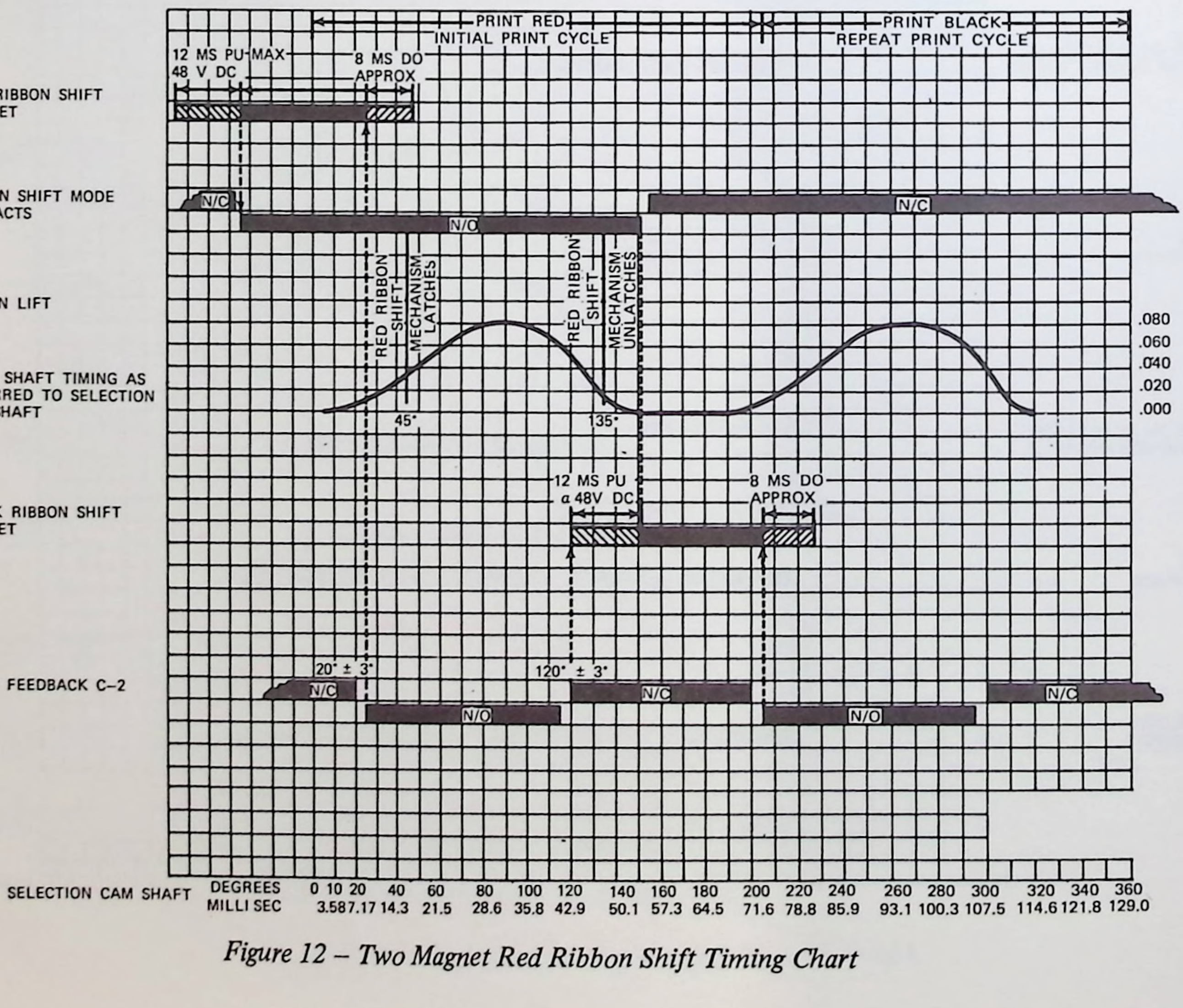


Figure 12 – Two Magnet Red Ribbon Shift Timing Chart

CORRESPONDENCE CIRCUITRY

Character selection on a correspondence wired I/O is the same as the standard IBM "Selectric" Typewriter. I/Os used on computer applications often use a single case typehead with a separate numeral 1.

Correspondence wiring uses a 7-bit code, which includes parity, and is a result of the mechanical operation of the selection mechanism.

The term "CODE" refers to the combination of signals, generated by the transmit contacts (Figure 13), used to identify to the electronics device the various functions and/or characters. The signal generated by each individual contact is normally referred to as a "bit". The electronics device will monitor the seven bit lines (v through x) to sense the conditions of selection transmit contacts.

The numeral two (2) will be used to describe the operation of the character selection circuitry. The numeral two on a correspondence machine is a ϕ tilt, positive 1 rotate character. Therefore, to print the character only the R1 selector latch will be active (pulled down by the selector bail) (Figure 13B). Also, only the R1 contact will be transferred (Figure 13A).

Therefore, the R1, and due to its reverse logic, the R5 bit lines will be inactive (no voltage at points v and x). All other bit lines will be active (voltage at points v,s,t,u, and w).

The input/output code chart shows this same condition (Figure 13C). The ϕ's represent inactive bit lines and the 1's represent active bit lines.

NOTE: If the electronic device requires the reverse situation, then the bit lines would be connected to the N/C point of R5 and the N/O points of all others.

During the output mode, the only magnets that should be pulsed to print out the number 2 are those magnets whose corresponding bit lines were active during input. With the R2, R2A, T1, T2 and ck pulsed, the only selector latch that will be pulled down by the latch bail will be the R1 latch.

Both upper and lower case codes for any one character are the same for correspondence wired machines. The shift mode contacts should be used to sample the mode of the shift mechanism.

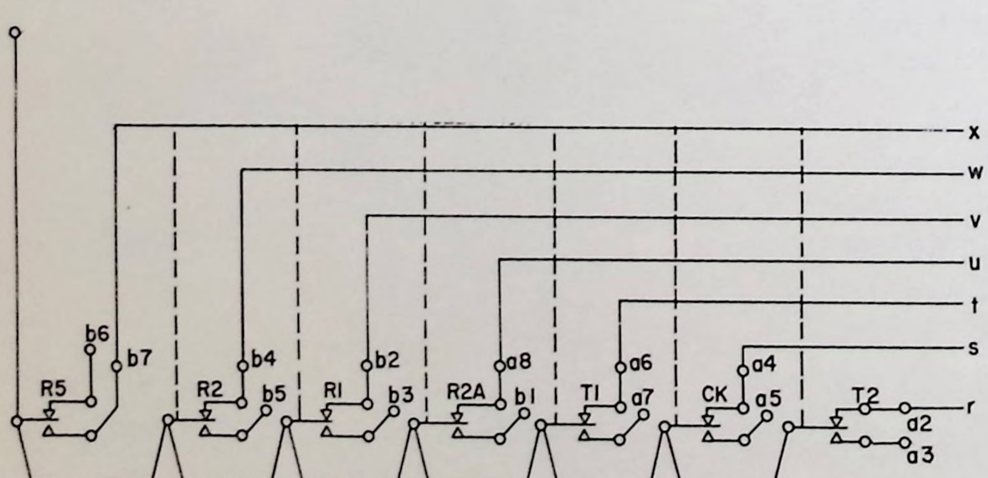
SELECTION AND TILT-ROTATE SCHEDULE										
CORRESPONDENCE KEYBOARD										
UC	LC	T2	CK	T1	R2A	R1	R2	R5	TLT	ROT
A	a	X	X			X	X	X	2	-2
B	b		X	X	X	X	X		1	+5
C	c		X	X		X	X	X	1	-2
D	d			X			X	X	1	-3
E	e		X	X			X		1	+2
F	f	X	X	X		X		X	3	-4
G	g	X		X				X	3	-5
H	h			X	X		X		1	+4
I	i	X				X	X		2	+3
J	j	X	X	X					3	0
K	k			X		X	X		1	+3
L	l		X	X	X		X	X	1	-1
M	m	X	X					X	2	-5
N	n		X	X		X			1	+1
O	o	X	X		X		X	X	2	-1
P	p	X		X			X		3	+2
Q	q	X	X	X		X	X		3	+3
R	r	X					X	X	2	-3
S	s	X			X		X		2	+4
T	t			X					1	0
U	u			X		X		X	1	-4
V	v	X				X		X	2	-4
W	w	X	X		X	X	X		2	+5
X	x		X	X			.	X	1	-5
Y	y	X	X	X	X		X		3	+4
Z	z		X						0	0
[	]							X	0	-5
	2					X			0	+1
#	3		X			X		X	0	-4
$	4				X		X	X	0	-1
%	5						X		0	+2
¢	6		X			X	X		0	+3
&	7		X				X	X	0	-3
*	8					X	X	X	0	-2
(	9				X	X	X		0	+5
)	0		X		X		X		0	+4
_	-	X		X	X	X	X		3	+5
+	=	X		X		X			3	+1
°	!	X							2	0
:	;	X	X	X			X	X	3	-3
"	'	X	X				X		2	+2
,	,	X		X		X	X	X	3	-2
.	.	X	X			X			2	+1
?	/	X		X	X		X	X	3	-1

X in Square* — Indicates: 1. Selection Contact Transferred
2. Latches Active

Blank Square* — Indicates Selection Magnet Energized

*Exception — X in R5 Column Indicates Both Selection Contact Transferred and Magnet Energized.

13B



13A

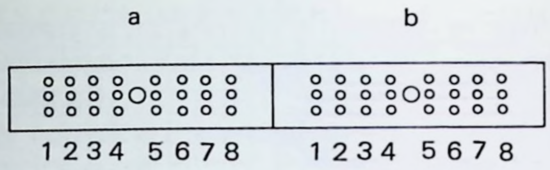
CORRESPONDENCE INPUT-OUTPUT CODES *								
CHARACTER	CASE	R1	R2	R2A	R-5	T1	T2	CK
A	U	0	0	1	1	1	0	0
a	L	0	0	1	1	1	0	0
B	U	0	0	0	0	0	1	0
b	L	0	0	0	0	0	1	0
C	U	0	0	1	1	0	1	0
c	L	0	0	1	1	0	1	0
D	U	1	0	1	1	0	1	1
d	L	1	0	1	1	0	1	1
E	U	1	0	1	0	0	1	0
e	L	1	0	1	0	0	1	0
F	U	0	1	1	1	0	0	0
f	L	0	1	1	1	0	0	0
G	U	1	1	1	1	0	0	1
g	L	1	1	1	1	0	0	1
H	U	1	0	0	0	0	1	1
h	L	1	0	0	0	0	1	1
I	U	0	0	1	0	1	0	1
i	L	0	0	1	0	1	0	1
J	U	1	1	1	0	0	0	0
j	L	1	1	1	0	0	0	0
K	U	0	0	1	0	0	1	1
k	L	0	0	1	0	0	1	1
L	U	1	0	0	1	0	1	0
l	L	1	0	0	1	0	1	0
M	U	1	1	1	1	1	0	0
m	L	1	1	1	1	1	0	0
N	U	0	1	1	0	0	1	0
n	L	0	1	1	0	0	1	0
O	U	1	0	0	1	1	0	0
o	L	1	0	0	1	1	0	0
P	U	1	0	1	0	0	0	1
p	L	1	0	1	0	0	0	1
Q	U	0	0	1	0	0	0	0
q	L	0	0	1	0	0	0	0
R	U	1	0	1	1	1	0	1
r	L	1	0	1	1	1	0	1
S	U	1	0	0	0	1	0	1
s	L	1	0	0	0	1	0	1
T	U	1	1	1	0	0	1	1
t	L	1	1	1	0	0	1	1
U	U	0	1	1	1	0	1	1
u	L	0	1	1	1	0	1	1
V	U	0	1	1	1	1	0	1
v	L	0	1	1	1	1	0	1
W	U	0	0	0	0	1	0	0
w	L	0	0	0	0	1	0	0
X	U	1	1	1	1	0	1	0
x	L	1	1	1	1	0	1	0
Y	U	1	0	0	0	0	0	0
y	L	1	0	0	0	0	0	0
Z	U	1	1	1	0	1	1	0
z	L	1	1	1	0	1	1	0
±	U	1	1	1	1	1	1	1
1	L	1	1	1	1	1	1	1
@	U	0	1	1	0	1	1	1
2	L	0	1	1	0	1	1	1
#	U	0	1	1	1	1	1	0
3	L	0	1	1	1	1	1	0
$	U	1	0	0	1	1	1	1
4	L	1	0	0	1	1	1	1
%	U	1	0	1	0	1	1	1
5	L	1	0	1	0	1	1	1
¢	U	0	0	1	0	1	1	0
6	L	0	0	1	0	1	1	0
&	U	1	0	1	1	1	1	0
7	L	1	0	1	1	1	1	0
*	U	0	0	1	1	1	1	1
8	L	0	0	1	1	1	1	1
(	U	0	0	0	0	1	1	1
9	L	0	0	0	0	1	1	1
)	U	1	0	0	0	1	1	0
0	L	1	0	0	0	1	1	0
—	U	0	0	0	0	0	0	1
-	L	0	0	0	0	0	0	1
+	U	0	1	1	0	0	0	1
=	L	0	1	1	0	0	0	1
¼	U	1	1	1	0	1	0	1
½	L	1	1	1	0	1	0	1
:	U	1	0	1	1	0	0	0
;	L	1	0	1	1	0	0	0
"	U	1	0	1	0	1	0	0
'	L	1	0	1	0	1	0	0
,	U	0	0	1	1	0	0	1
,	L	0	0	1	1	0	0	1
.	U	0	1	1	0	1	0	0
.	L	0	1	1	0	1	0	0
?	U	1	0	0	1	0	0	1
/	L	1	0	0	1	0	0	1

*Any machine equipped with correspondence wiring has identical input and output coding. I.e., identical "typewriter-to-line" and "line-to-typewriter" coding.

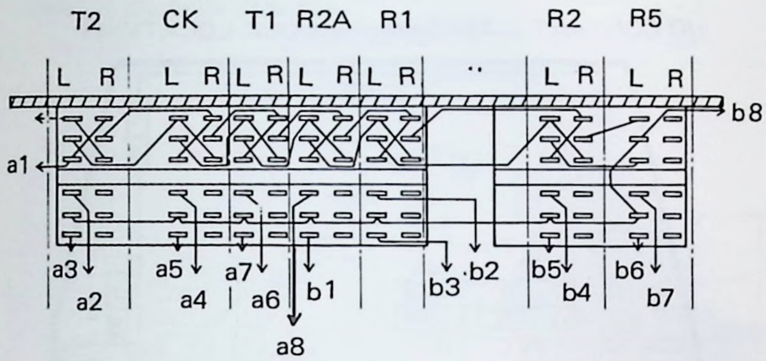
13C

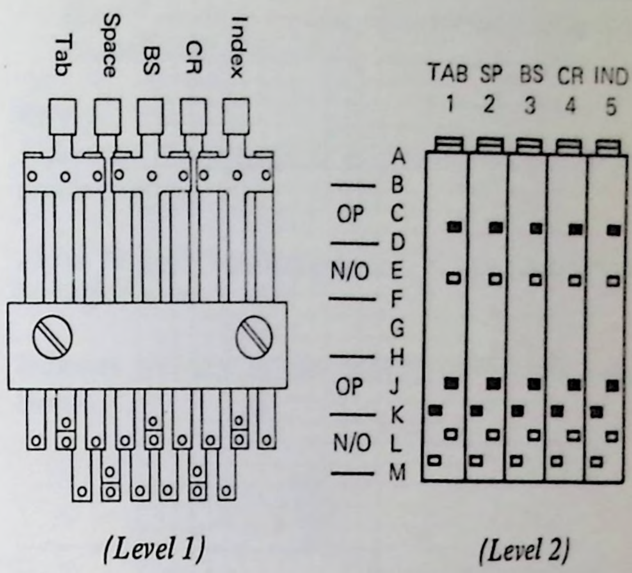
Figure 13 – Correspondence Input/Output Codes

The following charts indicate proper wiring for selection and operational contacts and magnet assemblies on a correspondence wired machine.



SELECTOR CONTACT TERMINAL BLOCK

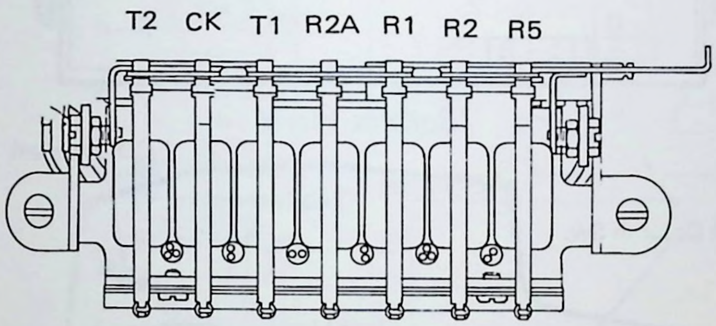




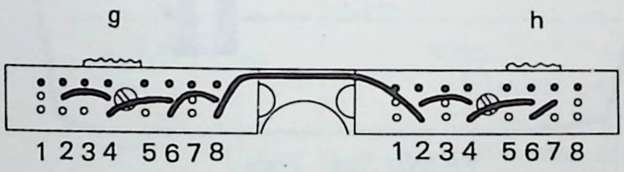
(Level 1) *(Level 2)*

OPERATIONAL TRANSMITTING CONTACTS

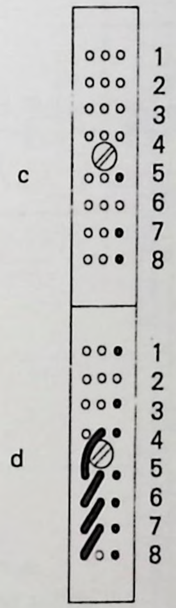
Note: The operational transmit contacts are wired directly to the cable. Use wiring diagram in Figure 16 to identify connections.



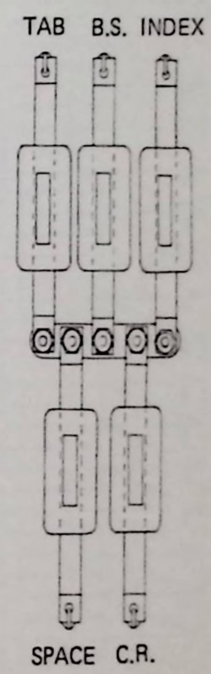
SELECTION MAGNETS



SELECTION MAGNETS TERMINAL BLOCK



OPERATIONAL TERMINAL BLOCK



OPERATIONAL MAGNETS

SELECTION MAGNET WIRING CHART		
COIL	BLACK LEAD	WHITE LEAD
T2	g-2	g-1
CHECK	g-4	g-3
T1	g-6	g-5
R2A	g-8	g-7
R1	h-2	h-1
R2	h-4	h-3
-R5	h-6	h-5

OPERATIONAL MAGNET WIRING CHART		
COIL	BLACK LEAD	WHITE LEAD
TAB	d-4	c-5
SPACE	d-5	c-7
BACKSPACE	d-6	c-8
CARRIER RETURN	d-7	d-1
INDEX	d-8	d-3

Figure 14 – Selection & Operational Contacts & Magnet Charts

Correspondence Wired I/O

CORRESPONDENCE INPUT-OUTPUT CODES*								
CHARACTER	CASE	R1	R2	R2A	R-5	T1	T2	CK
A	U	0	0	1	1	1	0	0
a	L	0	0	1	1	1	0	0
B	U	0	0	0	0	0	1	0
b	L	0	0	0	0	0	1	0
C	U	0	0	1	1	0	1	0
c	L	0	0	1	1	0	1	0
D	U	1	0	1	1	0	1	1
d	L	1	0	1	1	0	1	1
E	U	1	0	1	0	0	1	0
e	L	1	0	1	0	0	1	0
F	U	0	1	1	1	0	0	0
f	L	0	1	1	1	0	0	0
G	U	1	1	1	1	0	0	1
g	L	1	1	1	1	0	0	1
H	U	1	0	0	0	0	1	1
h	L	1	0	0	0	0	1	1
I	U	0	0	1	0	1	0	1
i	L	0	0	1	0	1	0	1
J	U	1	1	1	0	0	0	0
j	L	1	1	1	0	0	0	0
K	U	0	0	1	0	0	1	1
k	L	0	0	1	0	0	1	1
L	U	1	0	0	1	0	1	0
l	L	1	0	0	1	0	1	0
M	U	1	1	1	1	1	0	0
m	L	1	1	1	1	1	0	0
N	U	0	1	1	0	0	1	0
n	L	0	1	1	0	0	1	0
O	U	1	0	0	1	1	0	0
o	L	1	0	0	1	1	0	0
P	U	1	0	1	0	0	0	1
p	L	1	0	1	0	0	0	1
Q	U	0	0	1	0	0	0	0
q	L	0	0	1	0	0	0	0
R	U	1	0	1	1	1	0	1
r	L	1	0	1	1	1	0	1
S	U	1	0	0	0	1	0	1
s	L	1	0	0	0	1	0	1
T	U	1	1	1	0	0	1	1
t	L	1	1	1	0	0	1	1
U	U	0	1	1	1	0	1	1
u	L	0	1	1	1	0	1	1
V	U	0	1	1	1	1	0	1
v	L	0	1	1	1	1	0	1
W	U	0	0	0	0	1	0	0
w	L	0	0	0	0	1	0	0
X	U	1	1	1	1	0	1	0
x	L	1	1	1	1	0	1	0
Y	U	1	0	0	0	0	0	0
y	L	1	0	0	0	0	0	0
Z	U	1	1	1	0	1	1	0
z	L	1	1	1	0	1	1	0
±	U	1	1	1	1	1	1	1
1	L	1	1	1	1	1	1	1
@	U	0	1	1	0	1	1	1
2	L	0	1	1	0	1	1	1
#	U	0	1	1	1	1	1	0
3	L	0	1	1	1	1	1	0
$	U	1	0	0	1	1	1	1
4	L	1	0	0	1	1	1	1
%	U	1	0	1	0	1	1	1
5	L	1	0	1	0	1	1	1
¢	U	0	0	1	0	1	1	0
6	L	0	0	1	0	1	1	0
&	U	1	0	1	1	1	1	0
7	L	1	0	1	1	1	1	0
*	U	0	0	1	1	1	1	1
8	L	0	0	1	1	1	1	1
(	U	0	0	0	0	1	1	1
9	L	0	0	0	0	1	1	1
)	U	1	0	0	0	1	1	0
0	L	1	0	0	0	1	1	0
–	U	0	0	0	0	0	0	1
.	L	0	0	0	0	0	0	1
+	U	0	1	1	0	0	0	1
=	L	0	1	1	0	0	0	1
¼	U	1	1	1	0	1	0	1
½	L	1	1	1	0	1	0	1
:	U	1	0	1	1	0	0	0
;	L	1	0	1	1	0	0	0
"	U	1	0	1	0	1	0	0
'	L	1	0	1	0	1	0	0
,	U	0	0	1	1	0	0	1
,	L	0	0	1	1	0	0	1
.	U	0	1	1	0	1	0	0
.	L	0	1	1	0	1	0	0
?	U	1	0	0	1	0	0	1
/	L	1	0	0	1	0	0	1

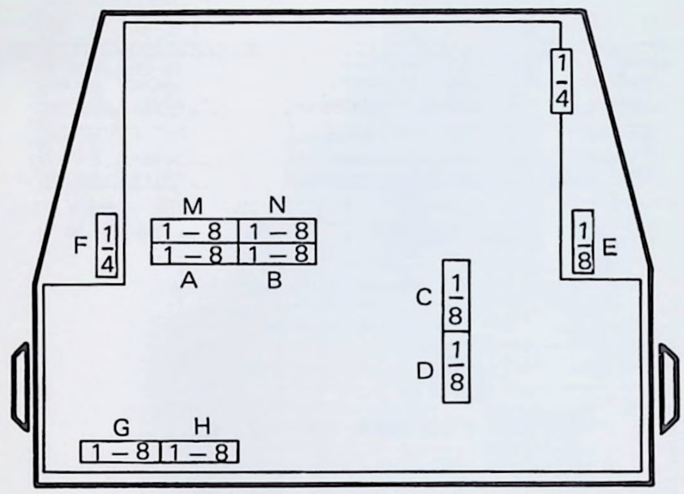
*Any machine equipped with correspondence wiring has identical input and output coding. I.e., identical "typewriter-to-line" and "line-to-typewriter" coding.

TYPEHEAD LAYOUT

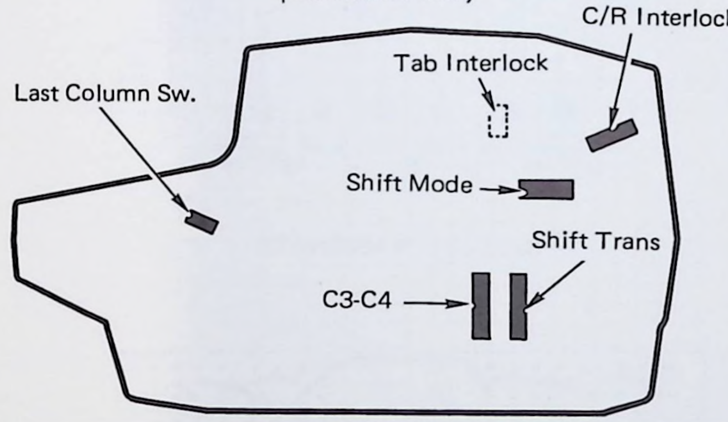
T - #'s = Tilt latches active
R - #'s = Rotate latches active

	Upper Case											Lower Case										
	-5	-4	-3	-2	-1	0	+1	+2	+3	+4	+5	-5	-4	-3	-2	-1	0	+1	+2	+3	+4	+5
T-0	[	#	&	*	$	Z	@	%	¢	)	(	]	3	7	8	4	z	2	5	6	0	9
T-1	X	U	D	C	L	T	N	E	K	H	B	x	u	d	c	l	t	n	e	k	h	b
T-2	M	V	R	A	O	°	.	"	I	S	W	m	v	r	a	o	!	.	'	i	s	w
T-1,2	G	F	:	,	?	J	+	P	Q	Y	_	g	f	;	,	/	i	=	p	q	y	-
	R-5	R-5,1	R-5,2	R-5,2,1	R-5,2,2A	* HOME	R-1	R-2	R-1,2	K-2,2A	R-1,2,2A	R-5	R-5,1	R-5,2	R-5,2,1	R-5,2,2A	* HOME	R-1	R-2	R-1,2	R-2,2A	R-1,2,2A

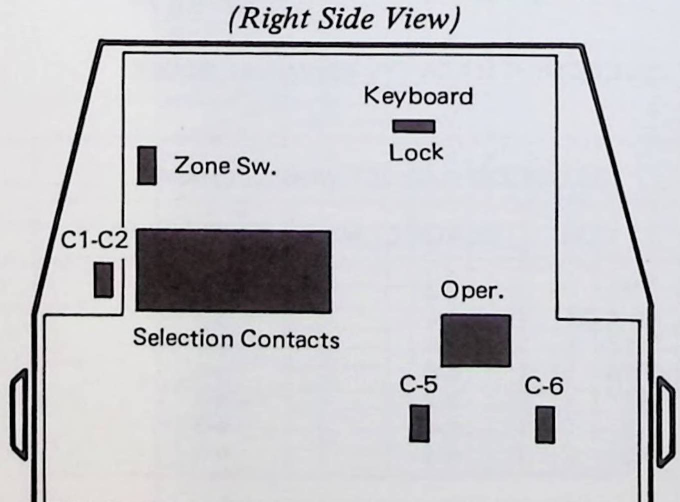
I/O CONTACT & TERMINAL BLOCK LOCATIONS



(Bottom View)



(Right Side View)



(Bottom View)

Note: No "Selectric" I/O Printer has all illustrated terminal blocks. The terminal blocks present appear in this configuration and are designated by indicated lettering.

Figure 15 – Correspondence Code Chart, Typehead Layout, Terminal Block & Contact Location

CORRESPONDENCE I/O WIRING

Contacts shown in their normal positions with all clutches latched and with shift cam detented in lower case.

Circuit Notes

1. Magnet common (pin "J") normally connected to Negative (Output).
2. Pin X normally connected to Negative for Input and feedback voltage.
3. Pins "n" and "y" must be externally connected to utilize C1 contact for gating. Terminal "n" should be used to control the state of a gating trigger to "y" if input current exceeds 300 ma.
4. Pins "a" and "b" offer optional access to the N/O or N/C side of the print and functional feedback contacts. Pin "b" provides a timing signal for the limiting of the magnet's energized period.

KEY

Alphebetic characters (A, a, etc.) correspond to AMP Connector positions.

Alpha Numeric combinations (a2, b2, etc.) are terminal block positions.

Indicates operation by cam or by other mechanical timing means.

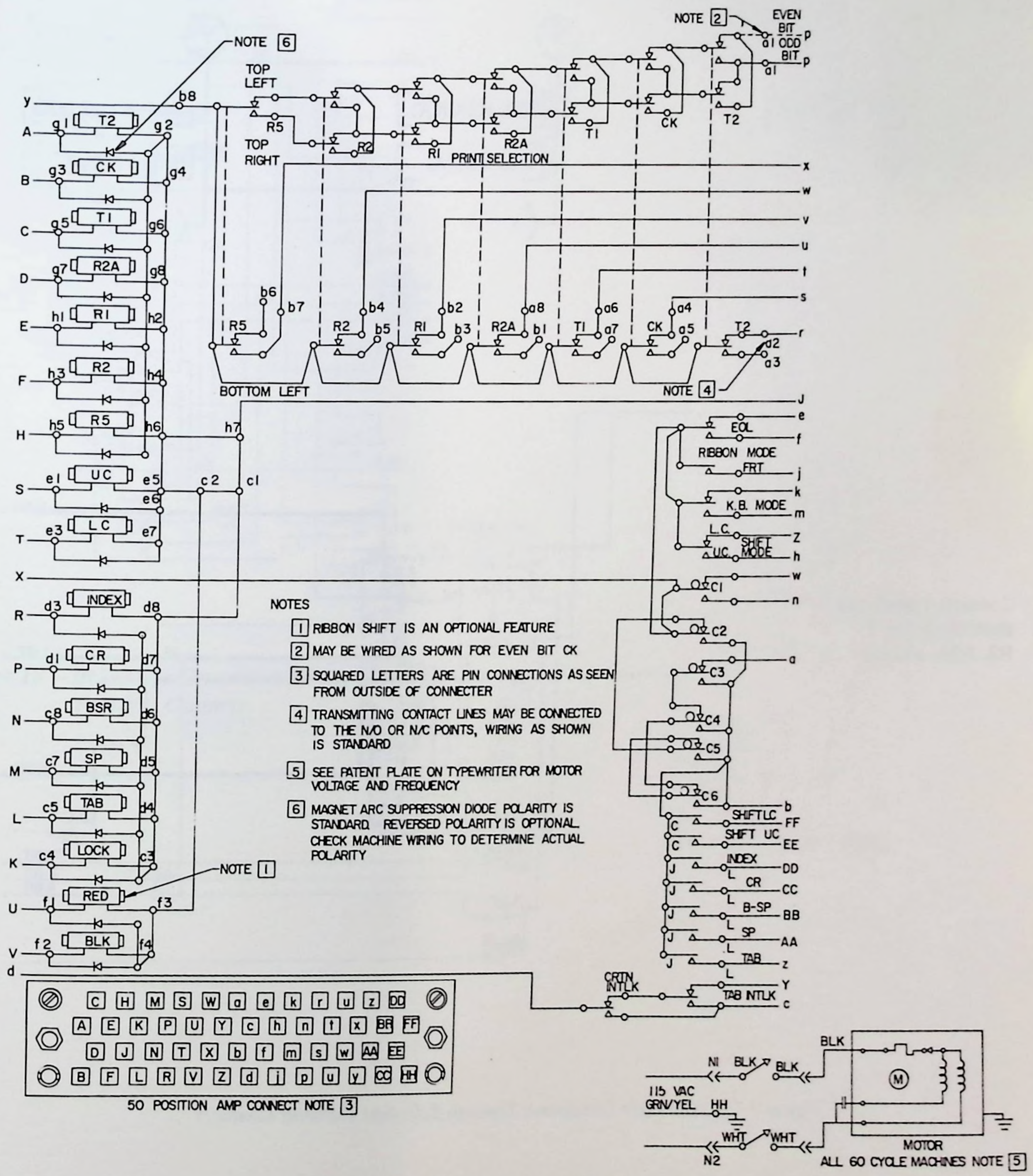


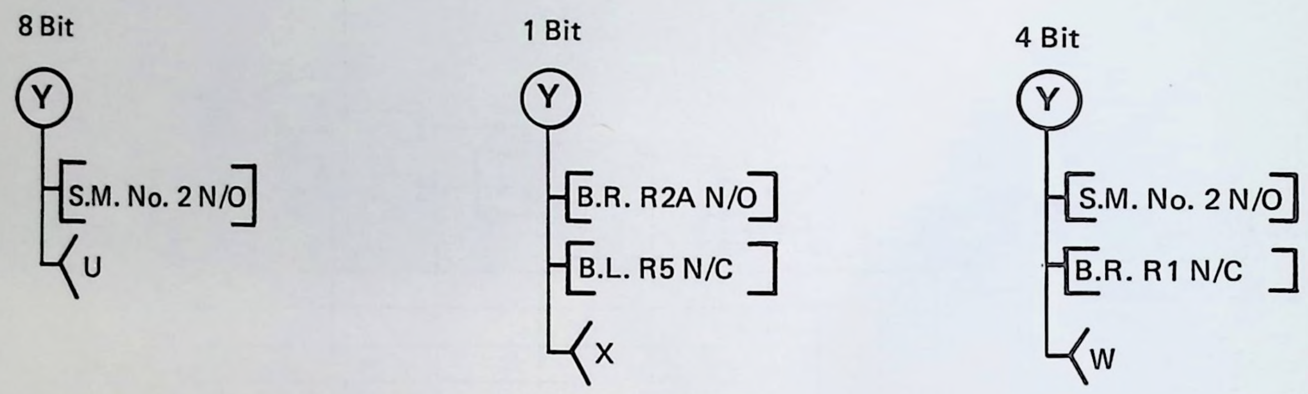
Figure 16 – Correspondence I/O Wiring

BCD CIRCUITRY

The BCD code is broken down into bits identified as 1, 2, 4, 8, A, B, and CK. This BCD code logic differs from the code generated by the selection mechanism. Therefore, the selection transmit contacts and the shift mode contacts through the use of blocking diodes, are wired to convert the logic to BCD (Figure 17).

To further explain this, the selection of the colon is an upper case, zero tilt, positive four rotate character. Therefore, only the shift mode #2 contact and the R2, R2A, and C contacts will be transferred. The BCD code for the colon is a 1 bit, 4 bit, and 8 bit. Figure 17 illustrates how these three bits are generated.

The operational codes are identical to character codes. Therefore, the "C" contacts should be sampled by the electronics device to differentiate between character codes and operational codes. The dotted line (Figure 17) shows that "C2" identified the code as a character.



Contacts Transferred
Shift Mode No. 2,
R2, R2A, and C-2.

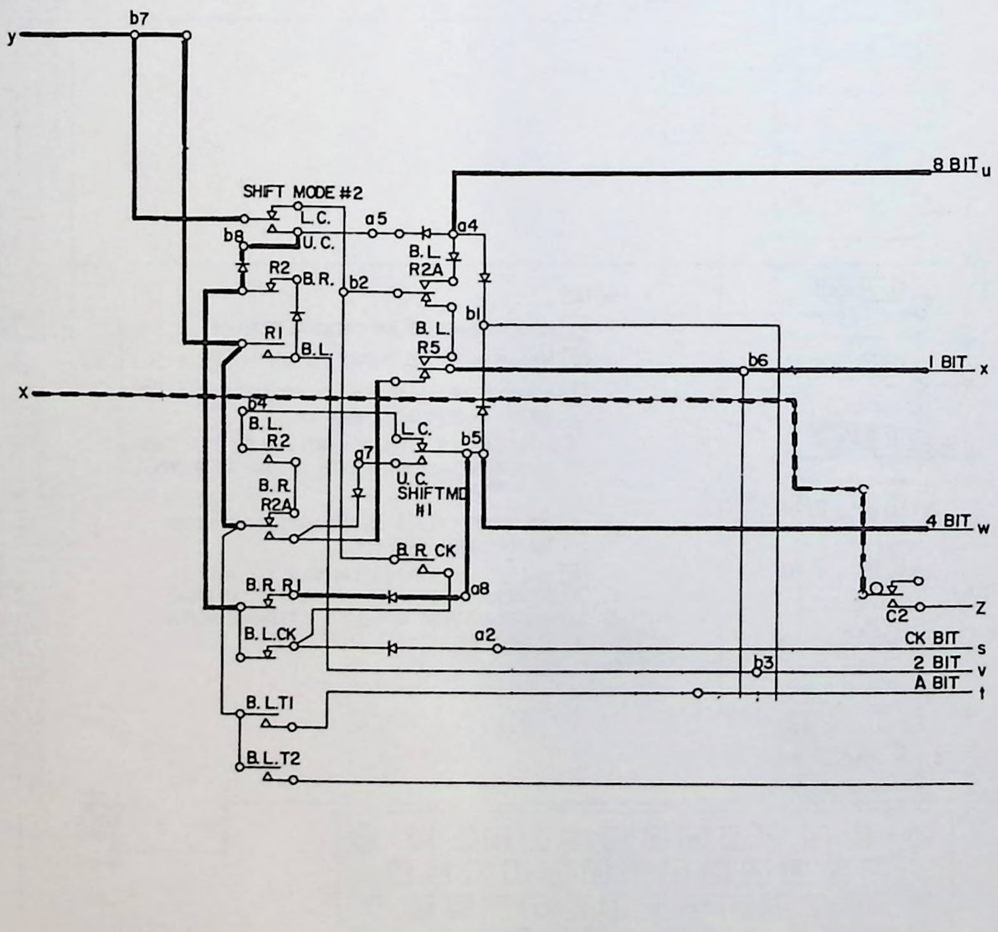


Figure 17 – BCD Code Generation Through Selection Transmit Contacts

The spacebar is used to illustrate the generation of an operational code. The BCD code for a spacebar is 1 bit, 4 bit, and 8 bit (Figure 18). This is identical to the "colon" previously discussed. however, it is generated differently. To identify this code as an operational code, "C5" transfers and terminal "b" can then be sampled by the electronics device.

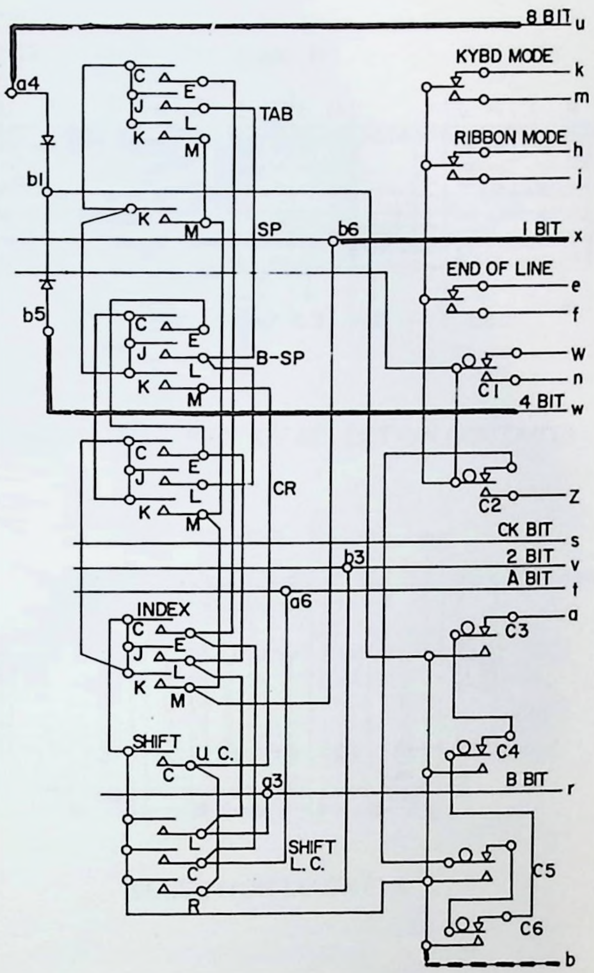


Figure 18 – BCD Code Generation Through Operational Transmit Contacts

Output Mode – For output use, the BCD machine must be supplied with coded pulses which relate to the selection magnet logic. This code has no similarity to the BCD code. A pulse must be applied to each individual magnet line (Figure 19). For example, a pulse must be applied to terminals A, C, and E, to print the colon.

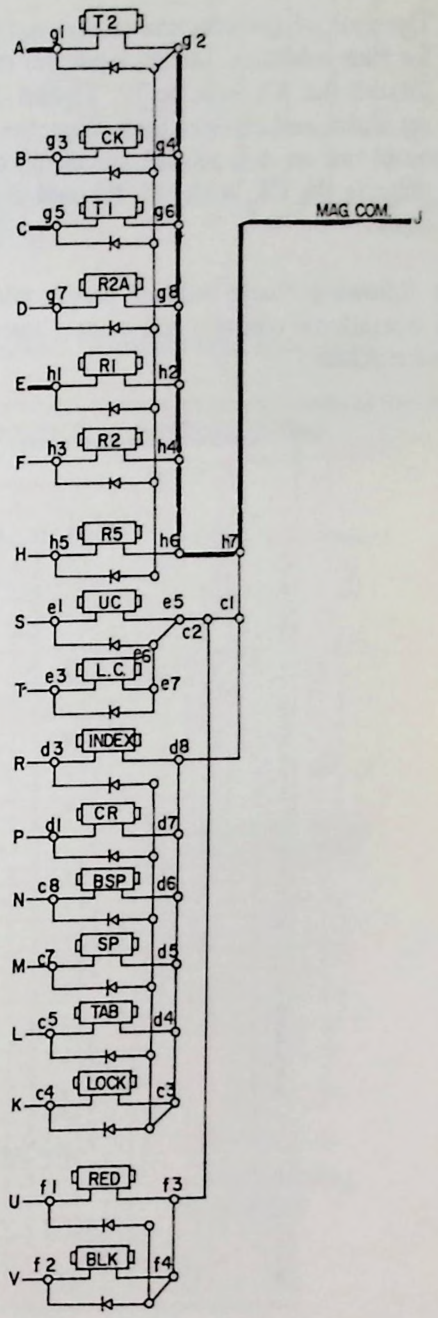


Figure 19 – Output Mode

Selection Chart – The Selection Chart (Figure 20) can be used to determine several conditions:

1. The tilt position of a character on the typehead.

2. The rotate position of a character on the typehead.

3 The characters available on the standard BCD typehead.

4. The state of the selection latches and transmit contacts for each selection. During input, for example, if an A is printed the X's indicate T2, T1 and -5 selector latches are active and transfer their respective contacts. During output, if an A is printed, the blanks opposite the "A", indicate the CK, R2A, R1, R2, and -5 magnets are energized.

The following charts indicate proper wiring for selection and operational contacts and magnet assemblies on a BCD wired machine.

SELECTION AND TILT-ROTATE SCHEDULE

BCD KEYBOARD

UC	LC	T2	CK	T1	R2A	R1	R2	R5	TLT	ROT
■	A	X		X				X	3	-5
■	B	X		X		X			3	+1
■	C	X	X	X		X		X	3	-4
■	D	X		X			X		3	+2
■	E	X	X	X			X	X	3	-3
■	F	X	X	X		X	X		3	+3
?	G	X		X		X	X	X	3	-2
¤	H	X		X	X		X	X	3	-1
[	I	X	X	X	X		X		3	+4
■	J	X	X					X	2	-5
■	K	X	X			X			2	+1
■	L	X				X		X	2	-4
■	M	X	X				X		2	+2
■	N	X					X	X	2	-3
■	O	X				X	X		2	+3
!	P	X	X			X	X	X	2	-2
*	Q	X	X		X		X	X	2	-1
]	R	X			X		X		2	+4
■	S		X	X		X			1	+1
■	T			X		X		X	1	-4
■	U		X	X			X		1	+2
■	V			X			X	X	1	-3
■	W			X		X	X		1	+3
ŧ	X		X	X		X	X	X	1	-2
%	Y		X	X	X		X	X	1	-1
¬	Z			X	X		X		1	+4
■	1							X	0	-5
■	2					X			0	+1
■	3		X			X		X	0	-4
■	4						X		0	+2
■	5		X				X	X	0	-3
■	6		X			X	X		0	+3
■	7					X	X	X	0	-2
°	8				X		X	X	0	-1
:	9		X		X		X		0	+4
>	Ø		X		X	X	X	X	0	0
;	-	X							2	0
√	'				X	X	X		0	+5
\	§			X					1	0
<	&	X	X	X					3	0
Δ	$	X	X		X	X	X		2	+5
↔	,		X	X	X	X	X		1	+5
±	.	X		X	X	X	X		3	+5
■	/		X	X				X	1	-5

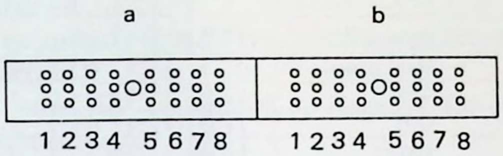
X in Square* – Indicates: 1. Selection Contact Transferred
2. Latches Active

Blank Square* – Indicates Selection Magnet Energized

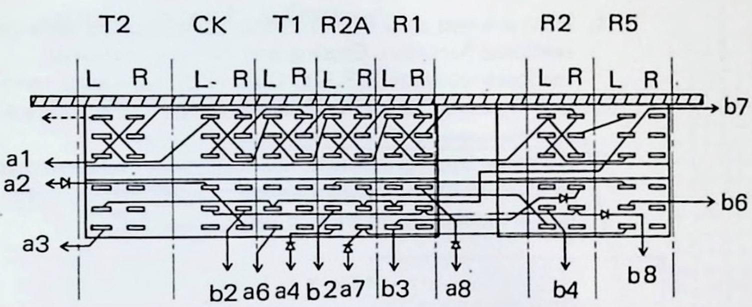
*Exception – X in R5 Column Indicates Both Selection Contac' Transferred and Magnet Energized.

Figure 20

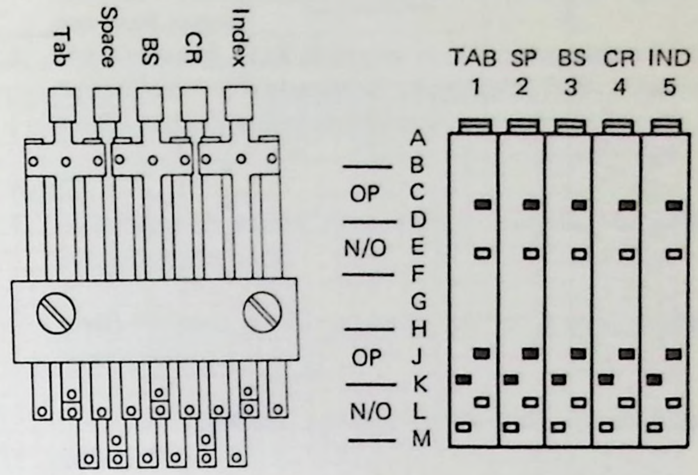
The following charts indicate proper wiring for selection and operational contacts and magnet assemblies on a BCD wired machine.



SELECTOR CONTACT TERMINAL BLOCK



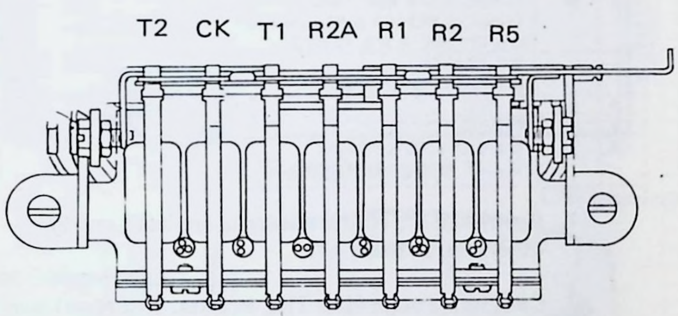
TERMINAL END VIEW OF SELECTION CONTACTS



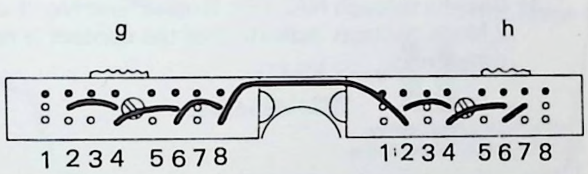
(Level 1) (Level 2)

OPERATIONAL TRANSMITTING CONTACTS

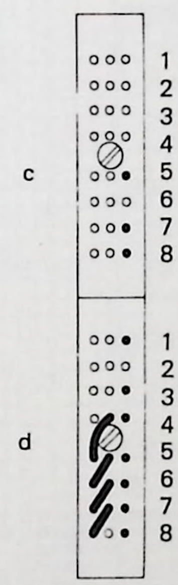
Note: The operational transmit contacts are wired directly to the cable Use wiring diagram in Figure 16 to identify connections.



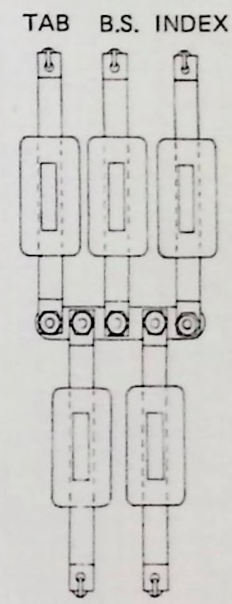
SELECTION MAGNETS



SELECTION MAGNETS TERMINAL BLOCK



OPERATIONAL TERMINAL BLOCK



OPERATIONAL MAGNETS

SELECTION MAGNET WIRING CHART		
COIL	BLACK LEAD	WHITE LEAD
T2	g-2	g-1
CHECK	g-4	g-3
T1	g-6	g-5
R2A	g-8	g-7
R1	h-2	h-1
R2	h-4	h-3
-R5	h-6	h-5

OPERATIONAL MAGNET WIRING CHART		
COIL	BLACK LEAD	WHITE LEAD
TAB	d-4	c-5
SPACE	d-5	c-7
BACKSPACE	d-6	c-8
CARRIER RETURN	d-7	d-1
INDEX	d-8	d-3

Figure 21 – Selection & Operational Contact & Magnet Charts

BCD INPUT CODES								
	Input Mode (E.T. to line) Code Transmitted							
		*BIT LINES PULSED						
CHARACTER	CASE	1	2	4	8	A	B	CK
■	U	0	0	0	0	0	0	0
A	L	1	0	0	0	1	1	0
■	U	0	0	0	0	0	0	0
B	L	0	1	0	0	1	1	0
■	U	0	0	0	0	0	0	0
C	L	1	1	0	0	1	1	1
■	U	0	0	0	0	0	0	0
D	L	0	0	1	0	1	1	0
■	U	0	0	0	0	0	0	0
E	L	1	0	1	0	1	1	1
■	U	0	0	0	0	0	0	0
F	L	0	1	1	0	1	1	1
?	U	0	1	0	1	1	1	1
G	L	1	1	1	0	1	1	0
⌑	U	0	0	1	1	1	1	1
H	L	0	0	0	1	1	1	0
[	U	1	0	1	1	1	1	0
I	L	1	0	0	1	1	1	1
■	U	0	0	0	0	0	0	0
J	L	1	0	0	0	0	1	1
■	U	0	0	0	0	0	0	0
K	L	0	1	0	0	0	1	1
■	U	0	0	0	0	0	0	0
L	L	1	1	0	0	0	1	0
■	U	0	0	0	0	0	0	0
M	L	0	0	1	0	0	1	1
■	U	0	0	0	0	0	0	0
N	L	1	0	1	0	0	1	0
■	U	0	0	0	0	0	0	0
O	L	0	1	1	0	0	1	0
!	U	0	1	0	1	0	1	0
P	L	1	1	1	0	0	1	1
⁂	U	0	0	1	1	0	1	0
Q	L	0	0	0	1	0	1	1
]	U	1	0	1	1	0	1	1
R	L	1	0	0	1	0	1	0
■	U	0	0	0	0	0	0	0
S	L	0	1	0	0	1	0	1
■	U	0	0	0	0	0	0	0
T	L	1	1	0	0	1	0	0
■	U	0	0	0	0	0	0	0
U	L	0	0	1	0	1	0	1
■	U	0	0	0	0	0	0	0
V	L	1	0	1	0	1	0	0
■	U	0	0	0	0	0	0	0
W	L	0	1	1	0	1	0	0
‡	U	0	1	0	1	1	0	0
X	L	1	1	1	0	1	0	1
%	U	0	0	1	1	1	0	0
Y	L	0	0	0	1	1	0	1
~	U	1	0	1	1	1	0	1
Z	L	1	0	0	1	1	0	0
■	U	0	0	0	0	0	0	0
1	L	1	0	0	0	0	0	0
■	U	0	0	0	0	0	0	0
2	L	0	1	0	0	0	0	0
■	U	0	0	0	0	0	0	0
3	L	1	1	0	0	0	0	1
■	U	0	0	0	0	0	0	0
4	L	0	0	1	0	0	0	0
■	U	0	0	0	0	0	0	0
5	L	1	0	1	0	0	0	1
■	U	0	0	0	0	0	0	0
6	L	0	1	1	0	0	0	1
■	U	0	0	0	0	0	0	0
7	L	1	1	1	0	0	0	0
@	U	0	0	1	1	0	0	1
8	L	0	0	0	1	0	0	0
:	U	1	0	1	1	0	0	0
9	L	1	0	0	1	0	0	1
>	U	0	1	1	1	0	0	0
Ø	L	0	1	0	1	0	0	1
;	U	0	1	1	1	0	1	1
–	L	0	0	0	0	0	1	0
√	U	1	1	1	1	0	0	1
‡	L	1	1	0	1	0	0	0
\	U	0	1	1	1	1	0	1
ƀ	L	0	0	0	0	1	0	0
<	U	0	1	1	1	1	1	0
&	L	0	0	0	0	1	1	1
△	U	1	1	1	1	0	1	0
$	L	1	1	0	1	0	1	1
←	U	1	1	1	1	1	0	0
,	L	1	1	0	1	1	0	1
‡	U	1	1	1	1	1	1	1
.	L	1	1	0	1	1	1	0
■	U	0	0	0	0	0	0	0
/	L	1	0	0	0	1	0	1

NOTES:

■ Selecting upper case type element positions where a black square (pillow) appears will generate an invalid code, and will cause a pillow to be printed. The parity check may appear either odd or even.

* Bits are formed by contact closure (print selection transmitting and shift mode) between terminal "Y" and the bit lines (see BCD Wiring Diagram, page 11).

BCD OUTPUT CODES								
	Output Mode (Line to E.T.) Code Received							
		MAGNETS PULSED						
CHARACTER	CASE	R1	R2	R2A	R-5	T1	T2	CK
■	U	0	0	0	0	0	0	0
A	L	1	1	1	1	0	0	1
■	U	0	0	0	0	0	0	0
B	L	0	1	1	0	0	0	1
■	U	0	0	0	0	0	0	0
C	L	0	1	1	1	0	0	0
■	U	0	0	0	0	0	0	0
D	L	1	0	1	0	0	0	1
■	U	0	0	0	0	0	0	0
E	L	1	0	1	1	0	0	0
■	U	0	0	0	0	0	0	0
F	L	0	0	1	0	0	0	0
?	U	0	0	1	1	0	0	1
G	L	0	0	1	1	0	0	1
⌑	U	1	0	0	1	0	0	1
H	L	1	0	0	1	0	0	1
[	U	1	0	0	0	0	0	0
I	L	1	0	0	0	0	0	0
■	U	0	0	0	0	0	0	0
J	L	1	1	1	1	1	0	0
■	U	0	0	0	0	0	0	0
K	L	0	1	1	0	1	0	0
■	U	0	0	0	0	0	0	0
L	L	0	1	1	1	1	0	1
■	U	0	0	0	0	0	0	0
M	L	1	0	1	0	1	0	0
■	U	0	0	0	0	0	0	0
N	L	1	0	1	1	1	0	1
■	U	0	0	0	0	0	0	0
O	L	0	0	1	0	1	0	1
!	U	0	0	1	1	1	0	0
P	L	0	0	1	1	1	0	0
⁂	U	1	0	0	1	1	0	0
Q	L	1	0	0	1	1	0	0
]	U	1	0	0	0	1	0	1
R	L	1	0	0	0	1	0	1
■	U	0	0	0	0	0	0	0
S	L	0	1	1	0	0	1	0
■	U	0	0	0	0	0	0	0
T	L	0	1	1	1	0	1	1
■	U	0	0	0	0	0	0	0
U	L	1	0	1	0	0	1	0
■	U	0	0	0	0	0	0	0
V	L	1	0	1	1	0	1	1
■	U	0	0	0	0	0	0	0
W	L	0	0	1	0	0	1	1
‡	U	0	0	1	1	0	1	0
X	L	0	0	1	1	0	1	0
%	U	1	0	0	1	0	1	0
Y	L	1	0	0	1	0	1	0
~	U	1	0	0	0	0	1	1
Z	L	1	0	0	0	0	1	1
■	U	0	0	0	0	0	0	0
1	L	1	1	1	1	1	1	1
■	U	0	0	0	0	0	0	0
2	L	0	1	1	0	1	1	1
■	U	0	0	0	0	0	0	0
3	L	0	1	1	1	1	1	0
■	U	0	0	0	0	0	0	0
4	L	1	0	1	0	1	1	1
■	U	0	0	0	0	0	0	0
5	L	1	0	1	1	1	1	0
■	U	0	0	0	0	0	0	0
6	L	0	0	1	0	1	1	0
■	U	0	0	0	0	0	0	0
7	L	0	0	1	1	1	1	1
@	U	1	0	0	1	1	1	1
8	L	1	0	0	1	1	1	1
:	U	1	0	0	0	1	1	0
9	L	1	0	0	0	1	1	0
>	U	0	0	0	1	1	1	0
Ø	L	0	0	0	1	1	1	0
;	U	1	1	1	0	1	0	1
–	L	1	1	1	0	1	0	1
√	U	0	0	0	0	1	1	1
‡	L	0	0	0	0	1	1	1
\	U	1	1	1	0	0	1	1
ƀ	L	1	1	1	0	0	1	1
<	U	1	1	1	0	0	0	0
&	L	1	1	1	0	0	0	0
△	U	0	0	0	0	1	0	0
$	L	0	0	0	0	1	0	0
←	U	0	0	0	0	0	1	0
,	L	0	0	0	0	0	1	0
‡	U	0	0	0	0	0	0	1
.	L	0	0	0	0	0	0	1
■	U	0	0	0	0	0	0	0
/	L	1	1	1	1	0	1	0

BCD MACHINE							
	OPERATIONAL BIT CODE						
OPERATION	1	2	4	8	A	B	CK
Space	1	0	1	1	0	0	0
Backspace	0	1	1	1	0	1	1
Tab	1	0	1	1	1	0	1
C.R.	1	0	1	1	0	1	1
Index	1	0	1	1	1	1	0
U.C. SH.	0	1	1	1	0	0	0
L.C. SH.	0	1	1	1	1	1	0

1. Both a 4 and an 8 Bit are transmitted during each operational function. Closing any N/O operational feedback contact (C3, C4, C5, or C6) connects terminal X (see BCD Wiring Diagram, page 11) to lines 4 and 8.
2. All other bits for operational functions are generated by closure of the operational transmitting contacts and are gated by either C3, C4, C5, or C6.

BCD MACHINE				
CONTACTS INVOLVED IN GENERATION OF ALPHA-NUMERIC BITS				
BIT	TERM. IN	THROUGH DIODES, PRINT SELECTION TRANSMITTING AND SHIFT MODE CONTACTS	TERM. OUT	CASE
1	x	R5 N/C & R2A* N/O	y	U or L
		R5 N/O & R2A N/C & #2 N/C	y	L
2	V	KI N/O	y	U or L
		D & R2* N/C & D & #2 N/O	y	U
4	W	#1 N/O & D & R2A* N/O	y	U
		#1 N/C & R2 N/O & R2A* N/C	y	L
		D & R1* N/C & D & #2 N/O	y	U
8	U	D & #2 N/O	y	U
		D & R2A N/O & #2 N/C	y	L
A	+	T1 N/O	y	U or L
B	V	T2 N/O	y	U or L
CK	S	D & CK* N/O & #2 N/C	y	L
		D & CK N/C & D & #2 N/O	y	U

1. Asterisked (*) rotate contacts are bottom right — all others are bottom left.
2. Circuits through N/O Tilt, Rotate, and No. 1 and No. 2 Mode contacts indicate that the contact is transferred.
3. Circuits through N/C Tilt, Rotate, and No. 1 and No. 2 Mode contacts indicate that the contact is not transferred.

TYPEHEAD LAYOUT

T - #'s = Tilt latches active
R - #'s = Rotate latches active

Upper Case											Lower Case											
-5	-4	-3	-2	-1	0	+1	+2	+3	+4	+5	-5	-4	-3	-2	-1	0	+1	+2	+3	+4	+5	
■	■	■	■	"	>	■	■	■	:	√	1	3	5	7	8	Ø	2	4	6	9	'	T-0
■	■	■	‡	%	\	■	■	■	~	⧺	/	T	V	X	Y	ƀ	S	U	W	Z	,	T-1
■	■	■	!	⁂	;	■	■	■	]	△	J	L	N	P	Q	–	K	M	O	R	$	T-2
■	■	■	?	⌑	<	■	■	■	[	‡	A	C	E	G	H	&	B	D	F	I	.	T-1,2
R-5	R-5,1	R-5,2	R-5,2,1	R-5,2,2A	*	R-1	R-2	R-1,2	R-2,2A	R-1,2,2A	R-5	R-5,1	R-5,2	R-5,2,1	R-5,2,2A	*	R-1	R-2	R-1,2	R-2,2A	R-1,2,2A	
					HOME											HOME						

*With one exception, home position (Zero Rotate) selection on the 73 Series is identical to the 72 Series — i.e., no rotate latches are active. On the BCD machine, home position, during zero tilt only (Ø & >), is selected by the cancellation method — i.e., all rotate latches are active (see the Selection and Tilt Rotate Schedule.

On the BCD machine only, the symbol > (Greater Than) may be used to check typehead homing.

Figure 22 – BCD Code Charts & Typehead Layout

BCD I/O WIRING

Contacts shown in their normal positions with all clutches latched and with shift cam detented in lower case.

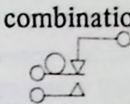
Circuit Notes –

1. Magnet common (pin "J") normally connected to Negative (Output).
2. Pin X normally connected to Negative for Input and feedback voltage.
3. Pins "n" and "y" must be externally connected to utilize C1 contact for gating. Terminal "n" should be used to control the state of a gating trigger to "y" if input current exceeds 300ma.
4. Pins "a" and "b" offer optional access to the N/O or N/C side of the functional feedback contacts. Pin "b" provides a timing signal for the limiting of the magnet's energized period.
5. The Keyboard Lock Solenoid is offered as either "Energized" or "De-energized" keyboard lock. Option should be specified on order.

Key –

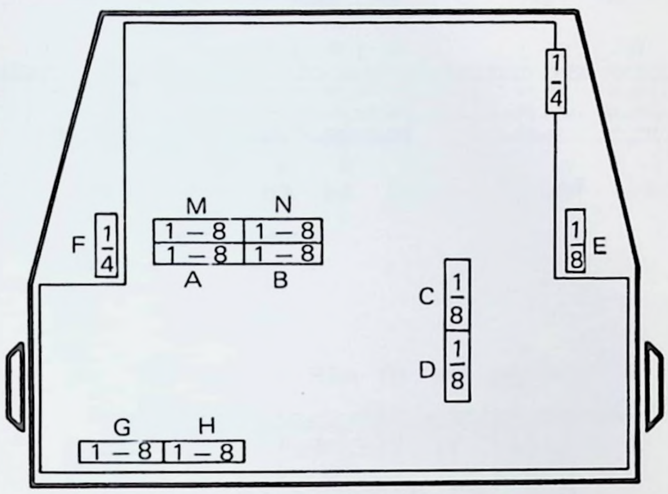
1. Alphabetic characters (A,a, etc.) correspond to AMP Connector positions.

2. Alpha Numeric combinations (a2,b2, etc.) are terminal block positions.

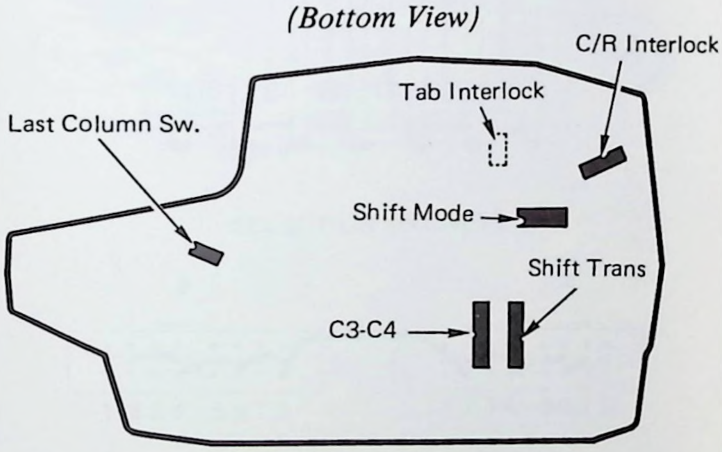


Indicates operation by cam or by other mechanical timing means.

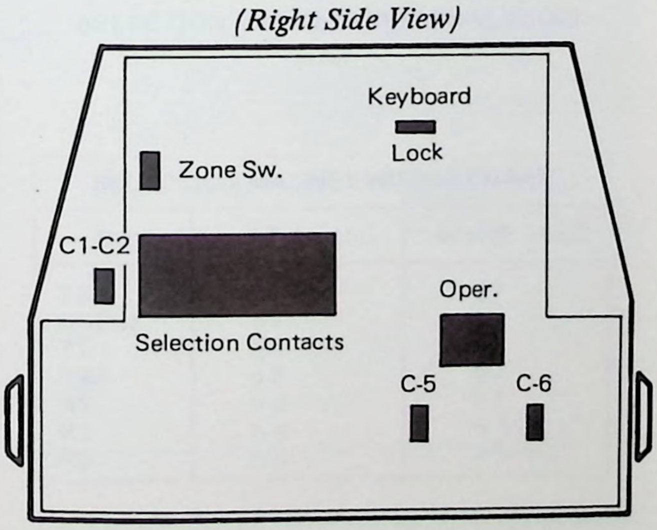
I/O CONTACT & TERMINAL BLOCK LOCATIONS



(Bottom View)



(Right Side View)



(Bottom View)

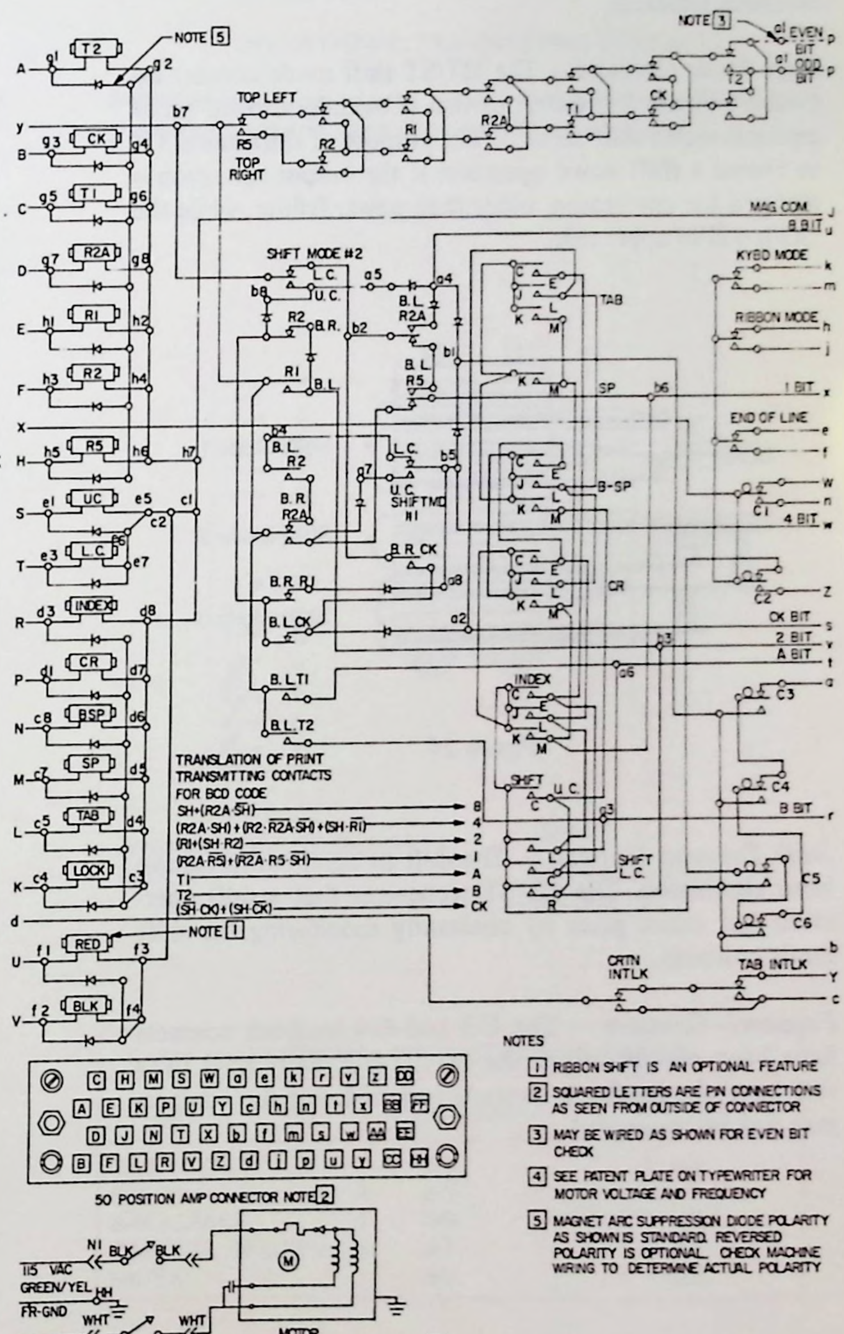


Figure 23 – BCD I/O Wiring, Contact And Terminal Block Locations

MT/ST-I/O CIRCUITRY

The circuitry for the MT/ST-I/O is a variation of the correspondence I/O. The following is a general explanation of the major differences.

Parity Contacts – Parity checking, in the MT/ST, is performed in the console. Therefore, the parity contacts are not installed in the I/O. On early level machines, the contacts were installed but were not connected.

Selection Transmit Contacts – The selection transmit contacts are connected so they complete a circuit when operated. The negative 5 contact is reversed. This is opposite to the correspondence machine where the selection transmit contacts "break" a circuit when operated.

Shift Contacts – The shift contacts will be discussed in three parts; shift mode contacts, transmit contacts, and feedback contacts.

Shift Mode Contacts – The MT/ST shift mode contact assembly (Figure 24) differs in that it includes a third set of contacts called shift mode 3. The purpose of shift mode 3 is to ensure a shift down operation if the output operation is stopped for any reason, other than power failure, while the I/O is still in upper case.

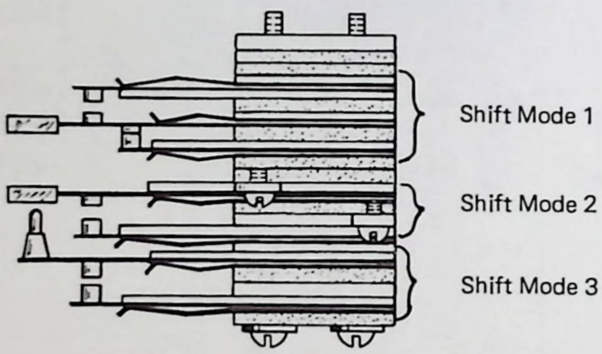
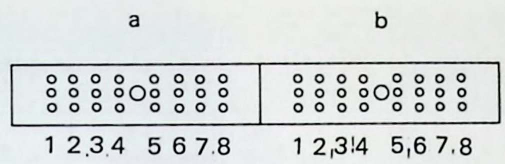


Figure 24

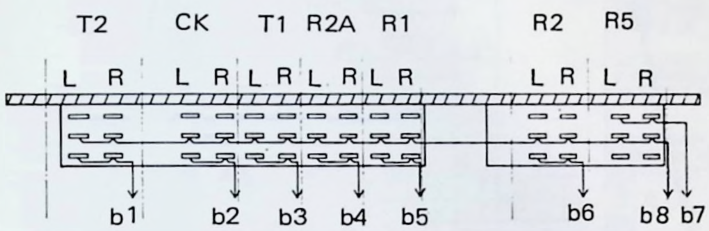
Shift Transmit Contacts – The shift transmit contacts have been eliminated. The MT/ST recognizes that a shift operation has taken place by constantly monitoring the shift mode contacts.

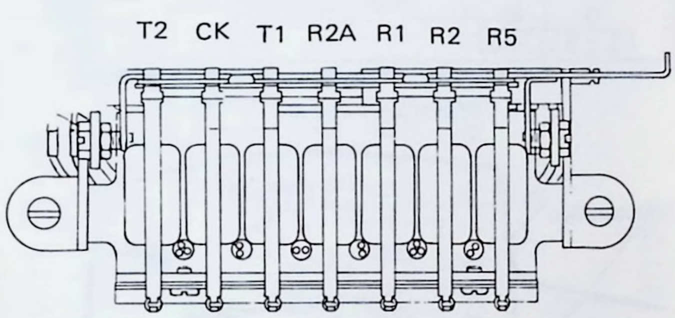
Feedback Contacts – The C-3 and C-4 feedback contacts have been eliminated on the MT/ST-I/O. Early level I/O's still have the feedback contacts installed, but the contacts may not be connected.

The following charts indicate proper wiring for selection and operational contacts and magnet assemblies on a MT/ST wired machine.

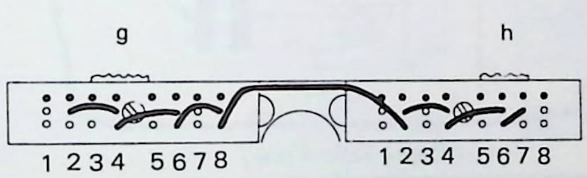


SELECTOR CONTACT TERMINAL BLOCK



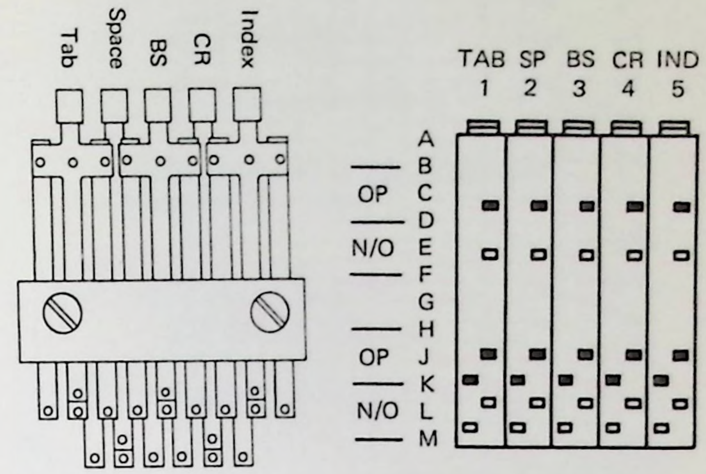


SELECTION MAGNETS



SELECTION MAGNETS TERMINAL BLOCK

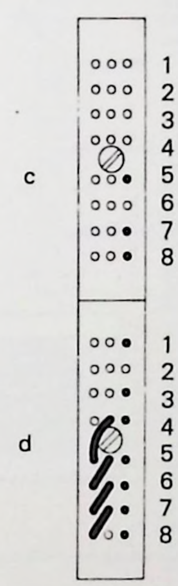
SELECTION MAGNET WIRING CHART		
COIL	BLACK LEAD	WHITE LEAD
T2	g-2	g-1
CHECK	g-4	g-3
T1	g-6	g-5
R2A	g-8	g-7
R1	h-2	h-1
R2	h-4	h-3
-R5	h-6	h-5



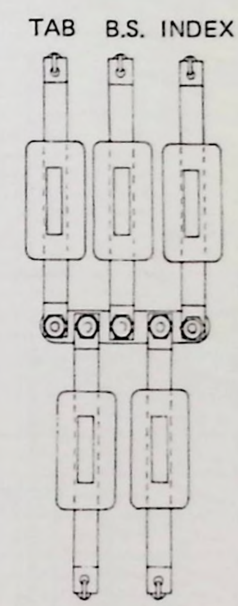
(Level 1) *(Level 2)*

OPERATIONAL TRANSMITTING CONTACTS

Note: The operational transmit contacts are wired directly to the cable Use wiring diagram in Figure 27 to identify connections.



OPERATIONAL TERMINAL BLOCK



OPERATIONAL MAGNETS

OPERATIONAL MAGNET WIRING CHART		
COIL	BLACK LEAD	WHITE LEAD
TAB	d-4	c-5
SPACE	d-5	c-7
BACKSPACE	d-6	c-8
CARRIER RETURN	d-7	d-1
INDEX	d-8	d-3

Fiugre 25 – MT/ST Wired I/O Selection & Operational Contacts & Magnets Charts

CORRESPONDENCE INPUT-OUTPUT CODES*								
CHARACTER	CASE	R1	R2	R2A	R-5	T1	T2	CK
A	U	0	0	1	1	1	0	0
a	L	0	0	1	1	1	0	0
B	U	0	0	0	0	0	1	0
b	L	0	0	0	0	0	1	0
C	U	0	0	1	1	0	1	0
c	L	0	0	1	1	0	1	0
D	U	1	0	1	1	0	1	1
d	L	1	0	1	1	0	1	1
E	U	1	0	1	0	0	1	0
e	L	1	0	1	0	0	1	0
F	U	0	1	1	1	0	0	0
f	L	0	1	1	1	0	0	0
G	U	1	1	1	1	0	0	1
g	L	1	1	1	1	0	0	1
H	U	1	0	0	0	0	1	1
h	L	1	0	0	0	0	1	1
I	U	0	0	1	0	1	0	1
i	L	0	0	1	0	1	0	1
J	U	1	1	1	0	0	0	0
j	L	1	1	1	0	0	0	0
K	U	0	0	1	0	0	1	1
k	L	0	0	1	0	0	1	1
L	U	1	0	0	1	0	1	0
l	L	1	0	0	1	0	1	0
M	U	1	1	1	1	1	0	0
m	L	1	1	1	1	1	0	0
N	U	0	1	1	0	0	1	0
n	L	0	1	1	0	0	1	0
O	U	1	0	0	1	1	0	0
o	L	1	0	0	1	1	0	0
P	U	1	0	1	0	0	0	1
p	L	1	0	1	0	0	0	1
Q	U	0	0	1	0	0	0	0
q	L	0	0	1	0	0	0	0
R	U	1	0	1	1	1	0	1
r	L	1	0	1	1	1	0	1
S	U	1	0	0	0	1	0	1
s	L	1	0	0	0	1	0	1
T	U	1	1	1	0	0	1	1
t	L	1	1	1	0	0	1	1
U	U	0	1	1	1	0	1	1
u	L	0	1	1	1	0	1	1
V	U	0	1	1	1	1	0	1
v	L	0	1	1	1	1	0	1
W	U	0	0	0	0	1	0	0
w	L	0	0	0	0	1	0	0
X	U	1	1	1	1	0	1	0
x	L	1	1	1	1	0	1	0
Y	U	1	0	0	0	0	0	0
y	L	1	0	0	0	0	0	0
Z	U	1	1	1	0	1	1	0
z	L	1	1	1	0	1	1	0
±	U	1	1	1	1	1	1	1
1	L	1	1	1	1	1	1	1
@	U	0	1	1	0	1	1	1
2	L	0	1	1	0	1	1	1
#	U	0	1	1	1	1	1	0
3	L	0	1	1	1	1	1	0
$	U	1	0	0	1	1	1	1
4	L	1	0	0	1	1	1	1
%	U	1	0	1	0	1	1	1
5	L	1	0	1	0	1	1	1
¢	U	0	0	1	0	1	1	0
6	L	0	0	1	0	1	1	0
&	U	1	0	1	1	1	1	0
7	L	1	0	1	1	1	1	0
*	U	0	0	1	1	1	1	1
8	L	0	0	1	1	1	1	1
(	U	0	0	0	0	1	1	1
9	L	0	0	0	0	1	1	1
)	U	1	0	0	0	1	1	0
0	L	1	0	0	0	1	1	0
–	U	0	0	0	0	0	0	1
-	L	0	0	0	0	0	0	1
+	U	0	1	1	0	0	0	1
=	L	0	1	1	0	0	0	1
¼	U	1	1	1	0	1	0	1
½	L	1	1	1	0	1	0	1
:	U	1	0	1	1	0	0	0
;	L	1	0	1	1	C	0	0
"	U	1	0	1	0	1	0	0
'	L	1	0	1	0	1	0	0
,	U	0	0	1	1	0	0	1
,	L	0	0	1	1	0	0	1
.	U	0	1	1	0	1	0	0
.	L	0	1	1	0	1	0	0
?	U	1	0	0	1	0	0	1
/	L	1	0	0	1	0	0	1

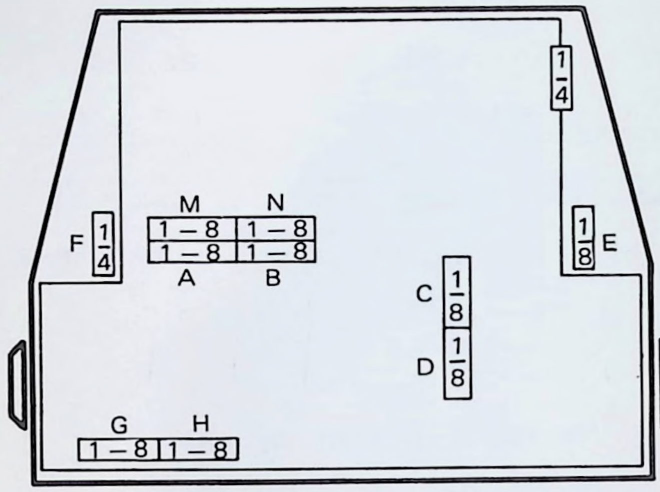
*Any machine equipped with correspondence wiring has identical input and output coding i.e., identical "typewriter-to-line" and "line-to typewriter" coding.

TYPEHEAD LAYOUT

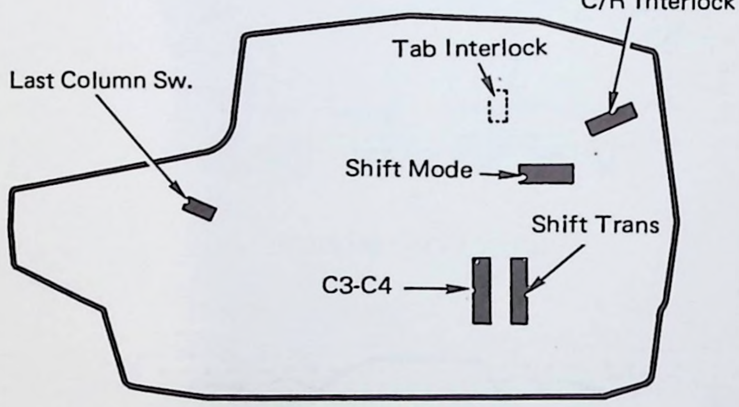
T - #'s = Tilt latches active
R - #'s = Rotate latches active

	Upper Case											Lower Case										
	-5	-4	-3	-2	-1	0	+1	+2	+3	+4	+5	-5	-4	-3	-2	-1	0	+1	+2	+3	+4	+5
T-0	[	"	&	*	$	Z	@	%	¢	)	(	]	3	7	8	4	z	2	5	6	0	9
T-1	X	U	D	C	L	T	N	E	K	H	B	x	u	d	c	l	t	n	e	k	h	b
T-2	M	V	R	A	O	°	.	"	I	S	W	m	v	r	a	o	!	.	'	i	s	w
T-1,2	G	F	:	,	?	J	+	P	Q	Y	_	g	f	;	,	/	j	=	p	q	y	-
	R-5	R-5,1	R-5,2	R-5,2,1	R-5,2,2A	* HOME	R-1	R-2	R-1,2	R-2,2A	R-1,2,2A	R-5	R-5,1	R-5,2	R-5,2,1	R-5,2,2A	* HOME	R-1	R-2	R-1,2	R-2,2A	R-1,2,2A

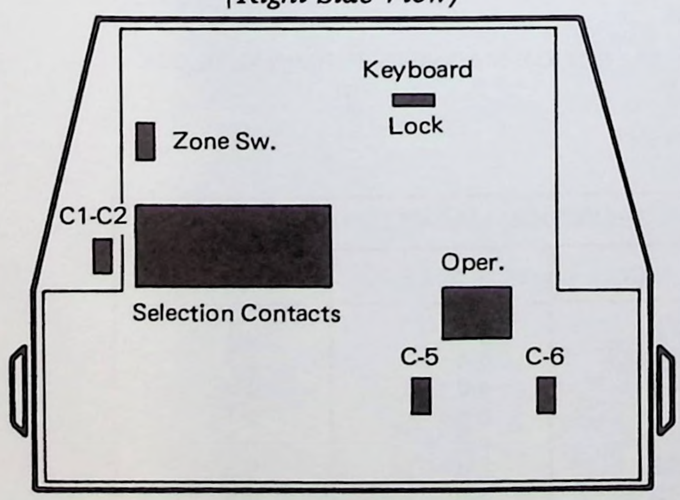
I/O CONTACT & TERMINAL BLOCK LOCATIONS



(Bottom View)



(Right Side View)



(Bottom View)

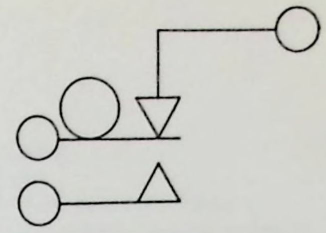
Note: No "Selectric" I/O Printer has all illustrated terminal blocks. The terminal blocks present appear in this configuration and are designated by indicated lettering.

Figure 26 – Correspondence Code Chart (MT/ST) Typehead Layout, And Contact And Terminal Block Location

MT/ST-I/O WIRING

Key
Numeric characters (1, 2, etc.) correspond to AMP Connector Positions.

Alpha Numeric combinations (a2, b2, etc.) are terminal block positions.



Indicates Operation By Cam Or By Other Mechanical Timing Means

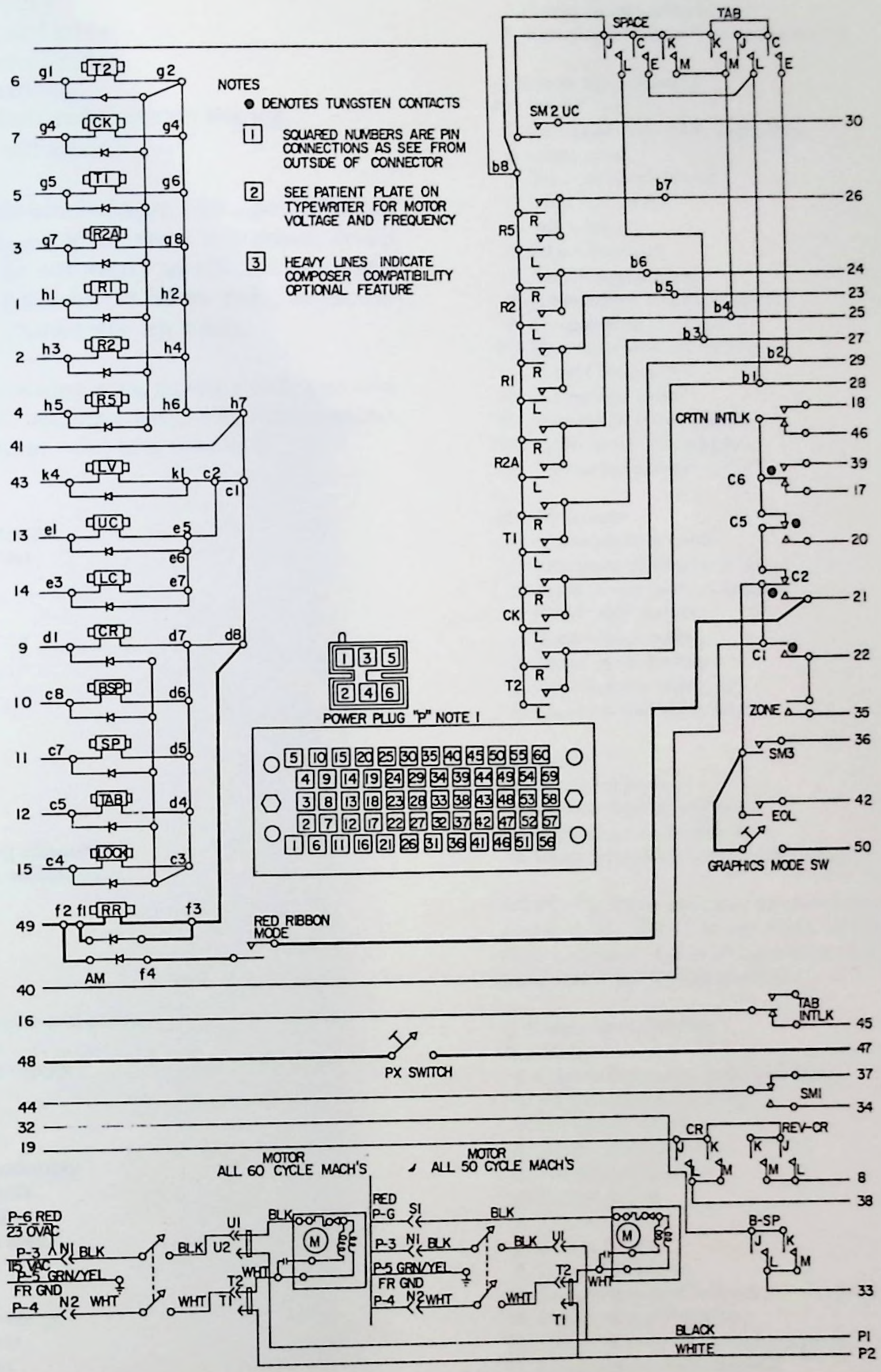


Figure 27 – MT/ST I/O Wiring

LUBRICATION

Machines with power on 24 hours daily require more frequent lubrication than machines used for single-shift operation. The following areas are primarily affected by idling time, since only the operational shaft is continuously turning:

1. Motor and motor pulley.
2. Cycle clutch spring and arbor.
3. Driven pulley hub and bearing.
4. Operational cam bearings.
5. Right operational shaft and shift cam bearing.
6. Shift clutch spring and arbor.

Since these machines are hot 24 hours daily, some lubricant evaporation can be expected in areas not driven during idling; however, they are not nearly so affected as Items 1 through 6. Where power is on 24 hours daily, we recommend lubricating these items every ten weeks.

As a general rule: All bearing areas having a sliding motion use IBM No. 23 and all bearing areas having rotational motion use IBM No. 10 unless otherwise specified.

EVERY CYCLE

I. Note operator's comments
II. Perform a functional test
III. Clean the following:
  a. Platen
  b. Deflector
  c. Feed Rolls
  d. Bail Rolls
  e. Card Holder
  f. Type Elements
  g. All Covers

CYCLE A

Check the following:
1. Rotate and tilt homing adjustments
2. Carrier and alignment adjustments
3. Motor and drive
4. Shift adjustments

Lubricate the following:
No. 10 Oil
1. Operational cam follower and pivots
2. Operational pull links
3. Operational cams and support
4. Motor bearings
5. Selection bail rollers
6. Pusher bail pivots
7. Operational contact assembly
8. Shift cam follower pivot
9. Cycle clutch pivot bail
10. All wicks in selection area

No. 23 Grease
1. Pusher bail cam and rollers
2. Operational arm pivots
3. Selector latch surfaces
4. Cycle clutch spring
5. Right bearing and shift clutch

CYCLE B

Check the following:
1. Keyboard area
  a. All keylevers operating freely
  b. All keylevers have enough travel to fully latch an interposer and restore positively
  c. Operation keylevers should allow for positive single operation
2. Carrier return adjustments
3. Indexing and paper feed adjustments

Lubricate the following:
No. 10 Oil
1. Keyboard lock roller and pivots
2. Index pawl
3. Tab torque bar pivots
4. Feed roll pivots
5. Index lever
6. Platen bushings
7. Tab links and pivots
8. Selector link and clevis pivots
9. Keyboard lockout bail
10. Keyboard lockout bellcrank
11. Rotate link pivots
12. Pusher arm pivots
13. Selector latch bail pivots
14. Cycle clutch trip pivots
15. Torque bar pivots

No. 23 Grease
1. Keyboard lock comb
2. Interposer sliding surfaces
3. Cycle clutch latch surfaces
4. Filter shaft surfaces
5. Cycle clutch spring
6. Platen guide bracket
7. Copy control eccentric
8. Carrier return latch keeper

CYCLE C

Check the following:
1. Ribbon feed adjustments
2. Escapement adjustments
3. Clean all contacts and check timing

NOTE: To clean contacts, use bond paper saturated in IBM Cleaning Fluid or SMS Card Lubricant, followed by a strip of dry bond paper; do not burnish or file.

Lubricate the following:
No. 10 Oil
1. Ribbon interposer sliding surface
2. Print cam roller bearings
3. Print shaft wipers
4. Detent lever bearings
5. Tilt bellcrank pivot
6. Rocker pivots
7. Tilt ring pivots
8. Detent pivots
9. Lower ball socket
10. Escapement cam follower
11. Margin rack and bushing
12. End of line contact actuating pivot
13. Power frame center bearing

No. 23 Grease
1. Tilt ring and ball joint
2. Ribbon lift cam surface
3. Ribbon feed and detent cam
4. Print cam
5. Ribbon feed pawl
6. Velocity Control Plate Pin
7. Cycle Clutch Spring
8. Right bearing and shift clutch
9. Idler gear teeth

REMOVALS

This section contains removal procedures for major parts and assemblies. The drawings in the input/output "Selectric" Typewriter Parts Catalog should be used when more detailed removal or assembly information is required.

Parts in the illustration accompanying the removal procedure are numbered with reference to the removal sequence. Some removals refer to certain steps of a previous removal procedure to eliminate producing duplicate information (Refer to the removal index).

The procedures in this section reflect the most direct method of removal or replacement. Some individuals may find one method superior to another, however, these procedures should be used as a guide to supplement individual service techniques.

REMOVAL CONTENTS

COVER REMOVAL

1. Position the carrier near the center.
2. Move the margin stops away from the carrier.
3. Pull the paper release lever and the paper bail forward.
4. Raise the top cover.
5. Remove the platen by releasing the latch at each end.
6. Latch the red pointer up.
7. Lift the top and center cover straight up.
8. Reinstall the platen.
9. Remove the retaining screws that hold the left and right front machine supports to the front shock mounts in the bottom cover.
10. The front of the machine may now be lifted and then pulled towards the front and be tilted up to the service position within the bottom cover.

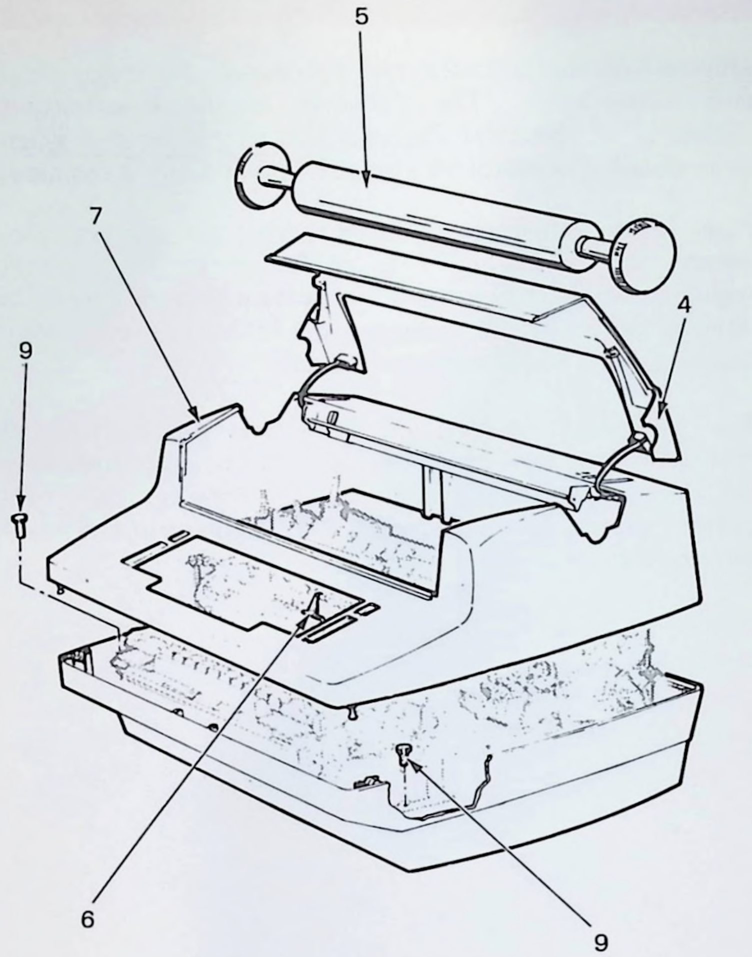


Figure 1 – Cover Removals

SELECTION CONTACT ASSEMBLY REMOVAL

1. Perform cover removal.
2. Remove the two contact mounting screws (NOTE: There are two spacers between the contact assembly and the power frame. Use caution when removing these screws to prevent loss of spacers.
3. Pivot the contact assembly away from the power frame.

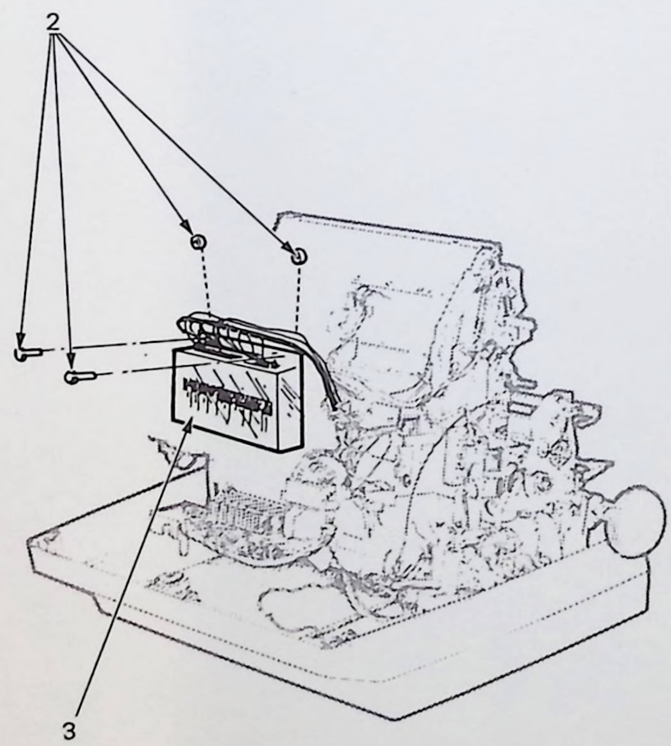
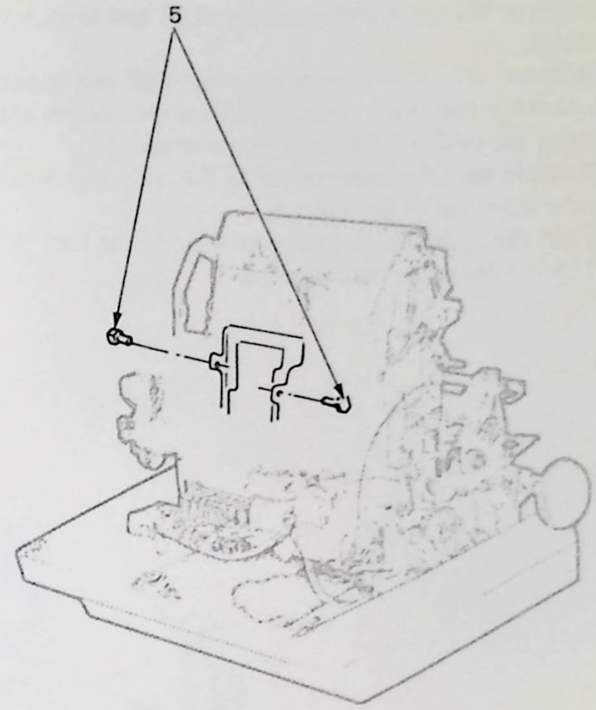


Figure 2 – Selection Contact Assembly Removal

CYCLE CLUTCH, CYCLE SHAFT & DRIVE BELT REMOVAL

1. Perform cover removal
2. Move carrier to extreme right and remove left dust cover.
3. Remove the gear guard.
4. Perform the selection contact removal, hold to the front with a rubber band.
5. Remove the two pusher cam follower pivot screws.
6. Remove the C-1/C-2 contact assembly.
7. Remove the cycle clutch check pawl and spring.
8. Remove the lower idler gear.
9. Remove the three cycle shaft bearing plate screws.
10. Loosen the bearing plate from the frame by prying it away from the frame (front first) with a screwdriver.
11. Remove the positive latch bail spring.
12. Force the positive latch bail down with a screwdriver and remove all selector latches from beneath the bail.
13. Pull the cycle shaft to the left pushing the Negative 5 and Rotate 2 links out of the way with the pusher end of a spring hook.
14. The drive belt may now be removed.
15. If replacement of the cycle shaft is necessary, be sure to add the necessary shims for proper end play.



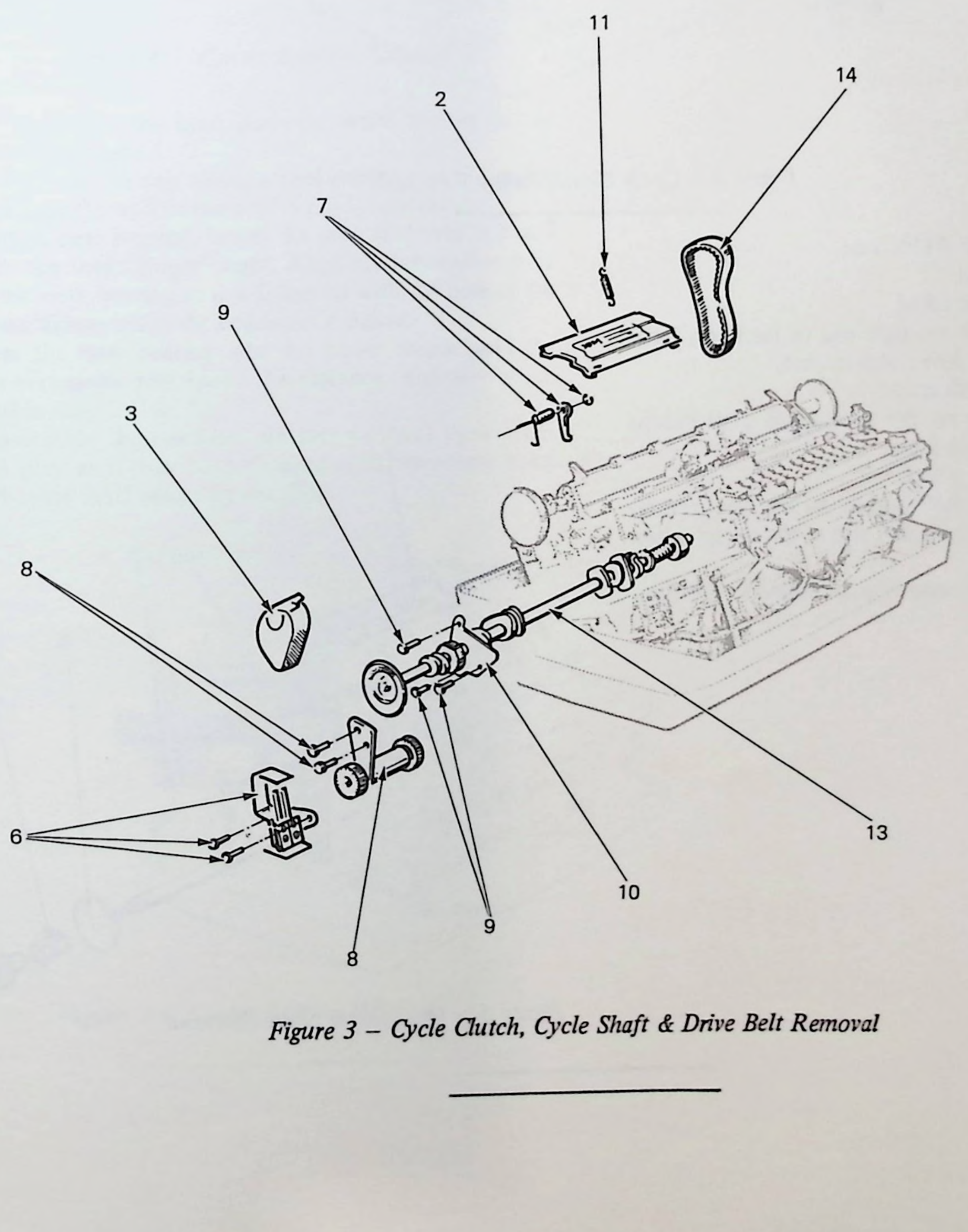


Figure 3 – Cycle Clutch, Cycle Shaft & Drive Belt Removal

CYCLE CLUTCH PULLEY REMOVAL

1. Perform cover removal.
2. Perform the cycle clutch, cycle shaft and drive belt removal.
3. Remove the two mounting nuts and one mounting screw for the cycle clutch inhibitor mechanism and remove the cycle clutch inhibitor mechanism.
4. Remove the two setscrews from the cycle clutch pulley. (one is on top of the other).
5. Slide the cycle clutch pulley hub out to the left.
6. Lift out the cycle clutch pulley.

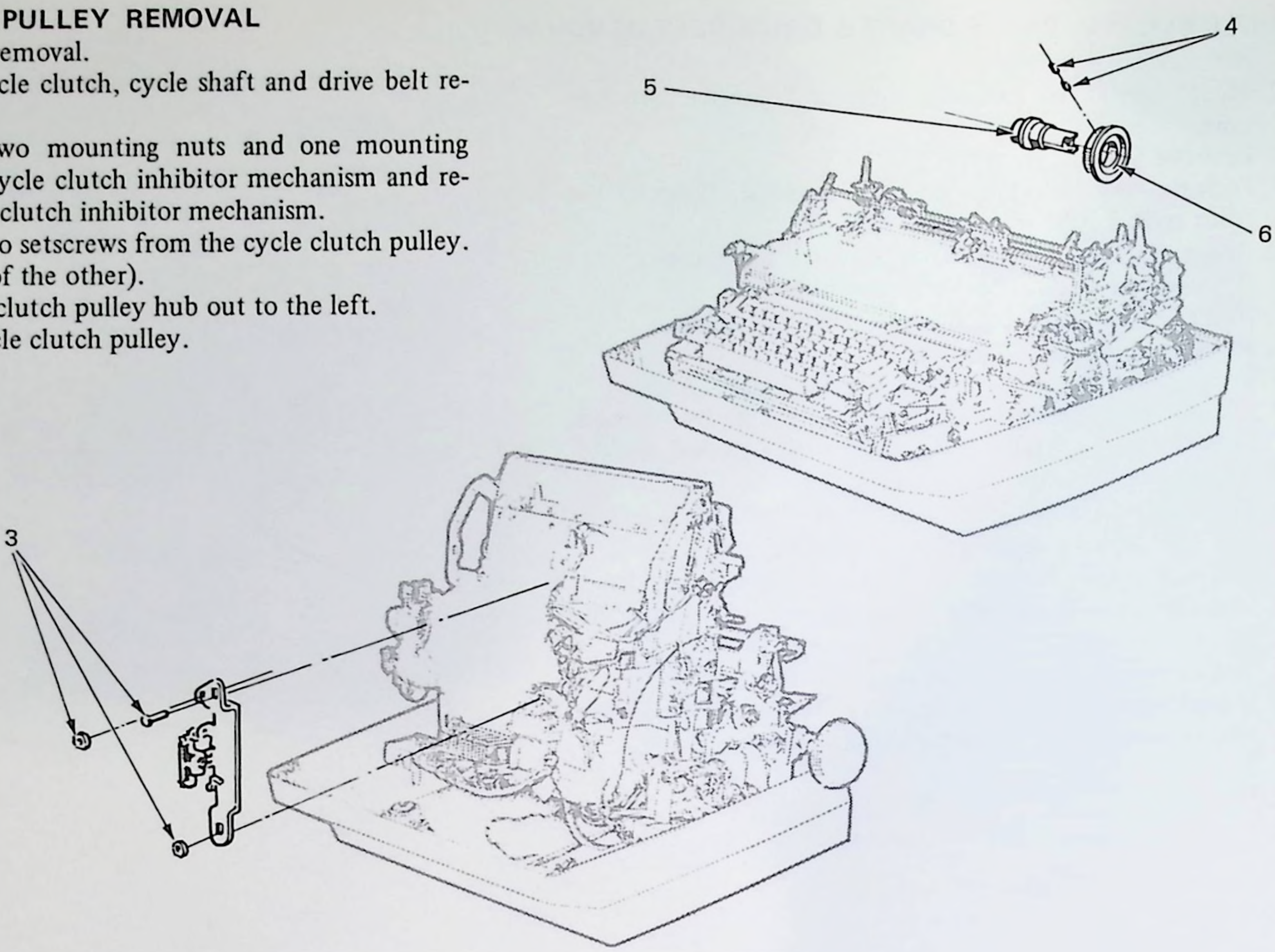


Figure 4 – Cycle Clutch Pulley Removal

OPERATIONAL SHAFT REMOVAL

1. Perform cover removal
2. Remove the right dust shield.
3. Remove the clip from the right end of the operational shaft and remove the shift clutch ratchet.
4. Remove the shift clutch spring.
5. Loosen all setscrews on the operational shaft except those in the shift clutch arbor.
6. Install the hand cycling tool.
7. Pull the operational shaft slightly to the right and remove the c-clip (s) from either side of the carrier return pinion.
8. The operational shaft may now be pulled to the right.

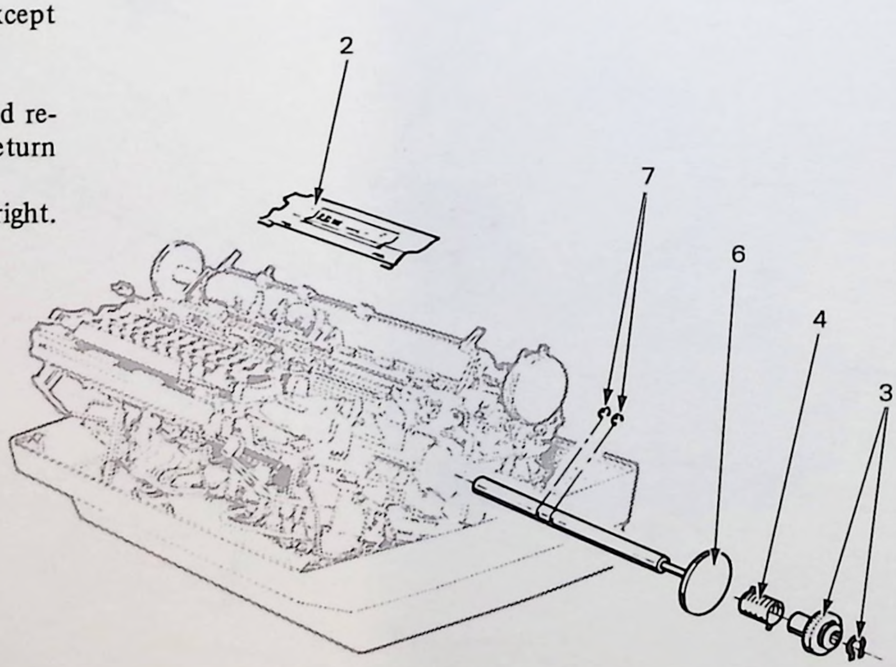


Figure 5 – Operational Shaft Removal

CENTER-BEARING REMOVAL

1. Perform cover removal.
2. Perform cycle shaft removal procedure.
3. Perform the cycle clutch pulley removal procedure.
4. Remove the cycle clutch latch.
5. Perform the operational shaft removal procedure.
6. Install the bearing tool as shown in Fig. 6 Gauge the position of the worn bearing by placing the Hooverometer foot against the power frame and slide the Hooverometer head against the bearing pusher. This setting will be used to reposition the new bearing.

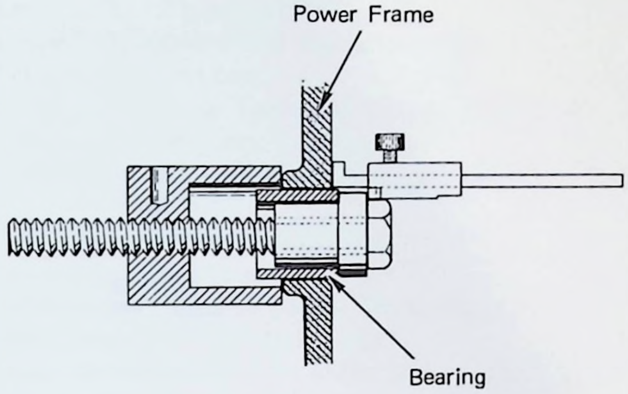


Figure 6 – Center Bearing Removal

7. By tightening the bolt, push the worn bearing out of the power frame.
   NOTE: If the cup turns, a tool can be inserted in the hole near the end of the cup to hold it stationary.
8. Using a new bearing, install the tool as shown in Fig. 7 with the tool "finger" tight. Align the lubrication hole in the new bearing so it will line up with the hole in the power frame when the bearing is installed.
9. Press the new bearing into the power frame until the Hooverometer just spans the distance originally measured in Step 2 (Fig. 6).
10. Reassemble the machine. Be sure to check cycle shaft end play as it may have changed with the new bearing and cycle shaft assembly installed.

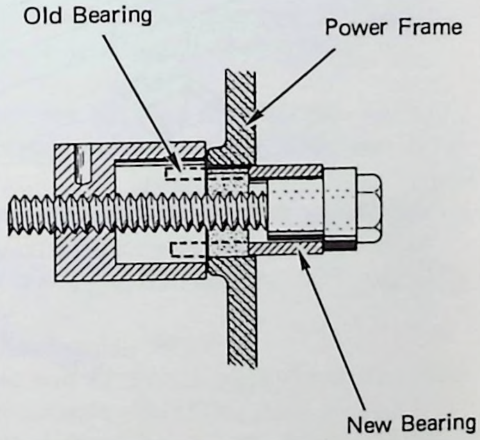


Figure 7 – Center Bearing Removal

ESCAPEMENT AND BACKSPACE PAWL REMOVAL

1. Perform cover removal.
2. Position carrier approximately four inches from left side frame.
3. Remove cardholder and its mounting bracket by removing the two front escapement bracket mounting screws.
4. Disconnect tab torque bar actuating link.
5. Remove clip from right end of tab torque bar.
6. Remove two rear escapement bracket mounting screws and gang clear finger.
7. Disconnect the ribbon lift control link spring from the escapement bracket on fabric ribbon machines.
8. Work carrier out from beneath escapement bracket.
9. Remove tab torque bar from its mounting holes and lift escapement bracket out of machine.
10. Disconnect escapement and backspace pawl springs.
11. Remove pawl mounting stud and escapement and backspace pawls.

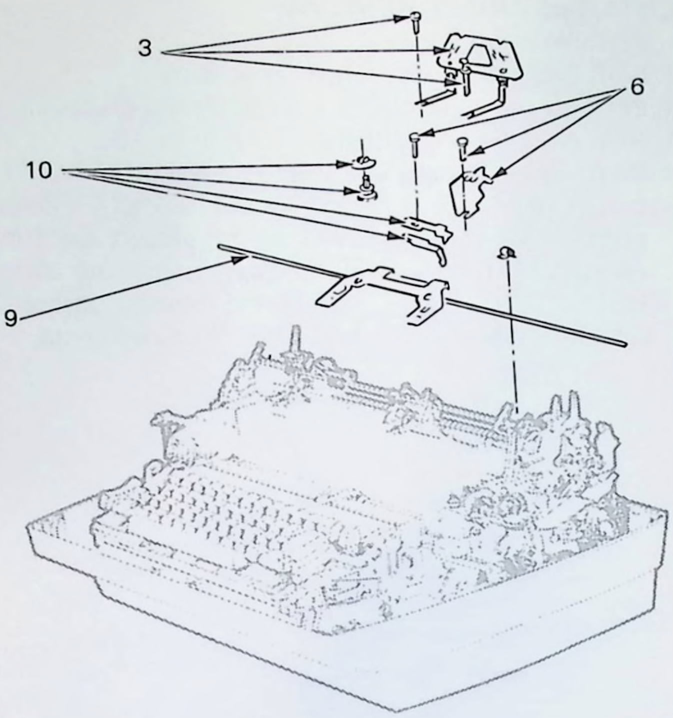


Figure 8 – Escapement And Backspace Pawl Removal

CARRIER AND ROCKER ASSEMBLY REMOVAL

1. Perform cover removal procedure.
2. Remove platen, deflector and feed rolls.
3. Remove dust shields.
4. Remove the cardholder and its mounting brackets by removing the two front escapement bracket mounting screws.
5. Slowly release rotate spring tension by holding the cage, releasing the cage retainer and allowing the cage to turn.
6. Remove the rotate tape.
7. Remove the tilt tape.
8. Disconnect the carrier return and escapement/tab cords from the carrier.
   NOTE: The ends of these two cords should be attached by using a paper clip. This ensures that the cords will not become disengaged from their pulleys.
9. On machines equipped with the dual velocity print mechanism or noprint spacebars, the velocity cable must be disconnected from the bottom of the carrier.
10. Remove the rear escapement bracket mounting screws and work the carrier out from beneath the escapement bracket.
11. Remove the print shaft.
    a. Level 1 print shafts can be removed by loosening the print shaft gear and sliding the print shaft out through the right bearing.
    b. Level 2 print shafts are removed by removing the C-clip to the right of the left print shaft bearing and sliding the print shaft out through the bearing.
12. The carrier assembly may now be lifted from the machine.

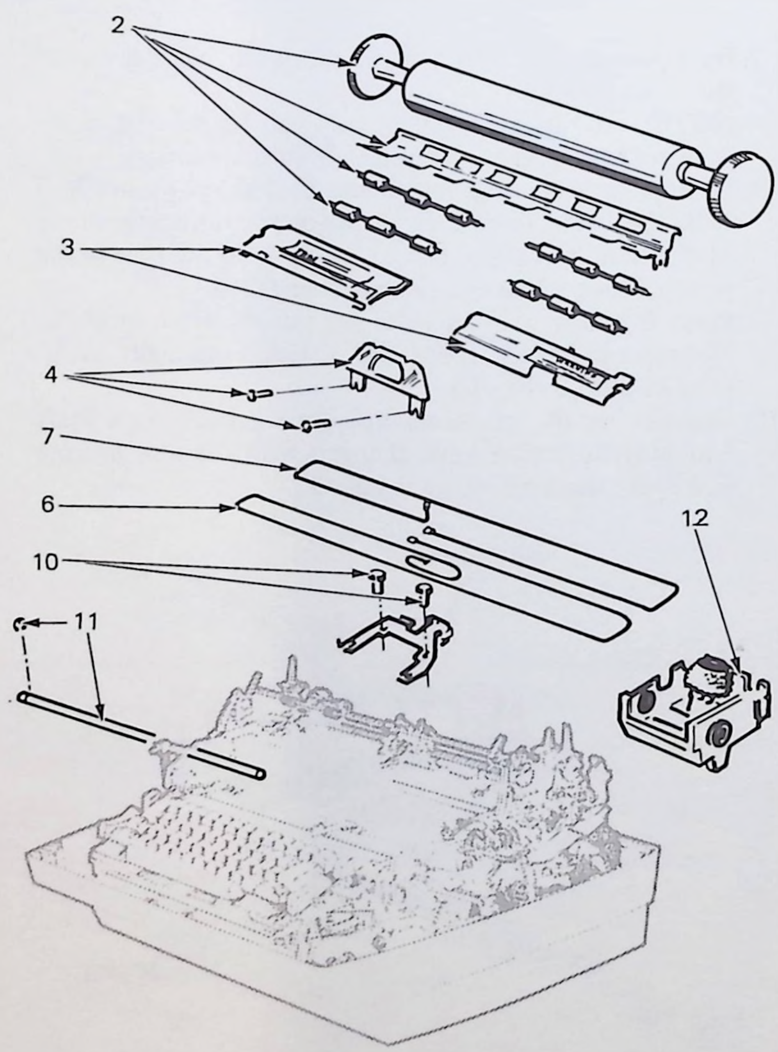


Figure 9 – Carrier And Rocker Assembly Removal

PRINT SLEEVE REMOVAL

1. Perform cover removal.
2. Center the carrier.
3. Remove the ribbon mechanism.
4. Remove the print shaft.
   a. Level 1 print shaft are removed by removing the print shaft gear and sliding the print shaft out through the right bearing.
   b. Level 2 print shafts are removed by removing the c-clip to the right side of the left bearing and sliding the print shaft out through the left bearing.
5. Remove the left print shaft wiper retainer.
6. Loosen the ribbon lift cam.
7. Loosen the ribbon feed and detent cam.
8. Loosen the print cam.
9. Slide the ribbon feed and detent cam to the right against the print cam.
10. Slide the ribbon lift cam to the right and onto the print shaft key.
11. Slide the print sleeve to the left.
12. Remove the print cam.
13. Remove the ribbon feed and detent cam.
14. Slide the print sleeve to the right.
15. Slide the ribbon lift cam to the left.
16. Remove the print shaft key.
17. Pull the print sleeve out through the left carrier bearing while sliding the ribbon lift cam off.

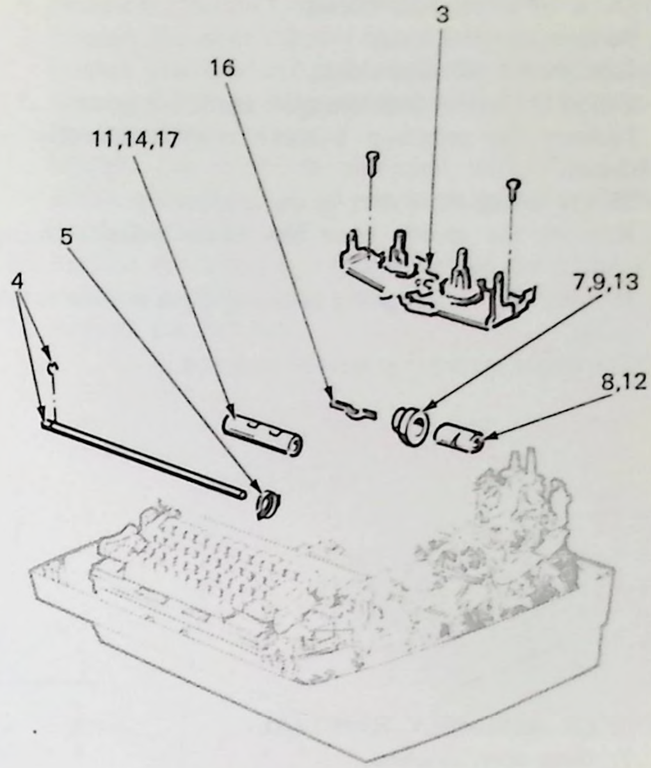


Figure 10 – Print Sleeve Removal

TILT RING AND ROTATE SHAFT REMOVAL

1. Perform cover removal.
2. Remove the ribbon and typehead.
3. Shift the machine to upper case.
4. Half cycle a zero rotate, tilt 1 character.
5. Remove the C-clip and disconnect the tilt pulley link. (Gearless tilt mechanism only.)
6. Loosen the tilt ring pivot pin setscrews.
7. Remove the two pivot pins.
8. The tilt ring may now be lifted straight up out of the machine. NOTE: During reassembly be sure to properly align the pin in the upper ball socket.

   This completes the tilt ring removal procedure. To remove the rotate shaft, continue with the following steps.
9. Remove the dog bone and left dust shield. Then position the carrier over the cycle shaft.
10. Perform the selection transmit contact assembly removal.
11. Loosen the rotate pulley setscrew.
12. Use the handle end of a small spring hook as a follower to push out the rotate shaft. This prevents the wedge in the rotate pulley from being lost. When replacing the shaft, be sure the pin is pointing towards the front left and right rear corners of the machine.

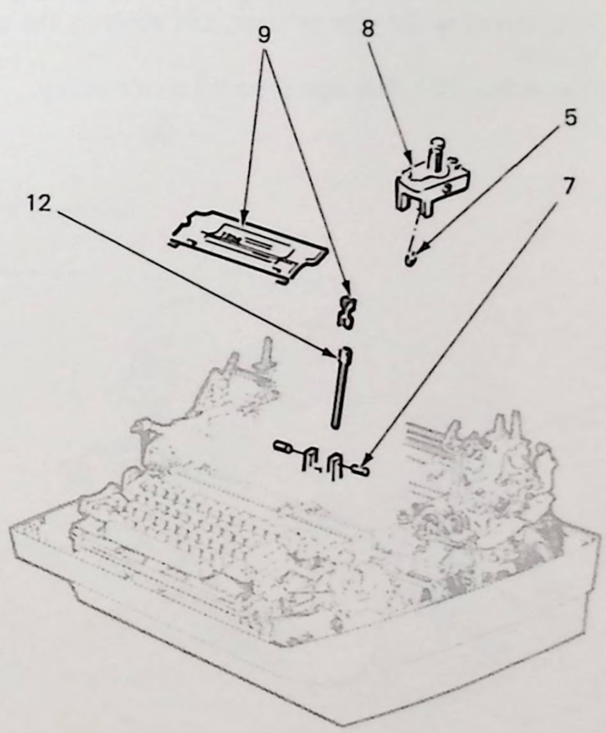


Figure 11 – Tilt Ring And Rotate Shaft Removal

ROTATE SPRING REMOVAL

1. Perform cover removal
2. Remove the left dust shield.
3. Center the carrier over the cycle shaft.
4. Perform the selection transmit contact assembly removal.
5. Slowly release the rotate spring tension.
6. Remove the screws from the rotate spring retaining plate.
7. Remove the rotate spring retaining plate and the rotate guide.
8. The rotate spring may now be removed.

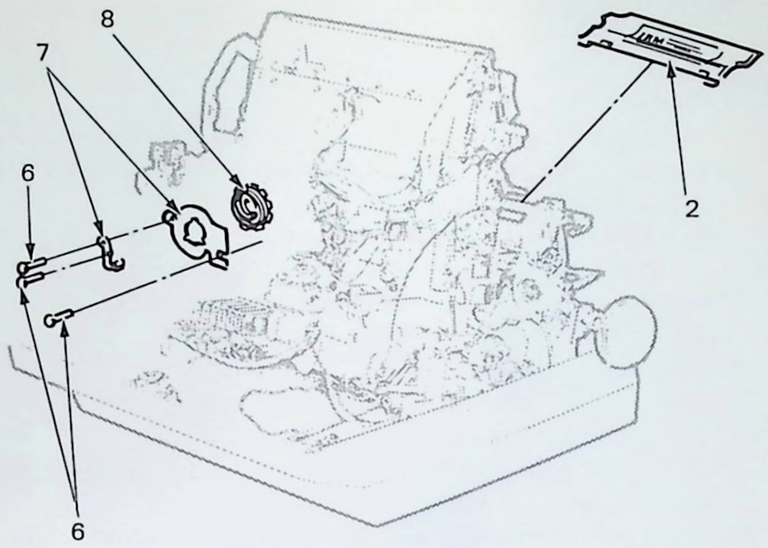


Figure 12 – Rotate Spring Removal

ROCKER ASSEMBLY REMOVAL

1. Perform cover removal
2. Remove the typehead.
3. Remove the left dust shield and position the carrier over the cycle shaft.
4. Remove the ribbon mechanism.
5. Remove the cardholder and its mounting brackets by removing the two front escapement bracket mounting screws.
6. Disconnect the tilt tape from the tilt bellcrank.
7. Remove the tilt bellcrank spring and tilt bellcrank.
8. Slowly release the rotate spring tension by holding the cage, releasing the cage retainer, and allowing the cage to turn.
9. Disconnect the rotate tape from the rotate pulley.
10. Remove the rocker restoring spring.
11. Perform the selection contact assembly removal procedure.
12. Remove the striker if present.
13. Perform the rotate spring removal procedure.
14. Remove the rotate pulley.
15. Remove the impression control or velocity plate.
16. Loosen the rocker pivot shaft setscrew.
17. Remove the c-clip from the right side of the rocker shaft.
18. Remove the rocker shaft. NOTE: It may be necessary to loosen the tape anchor screw for shaft removal.
19. The rocker assembly may now be removed from the carrier.

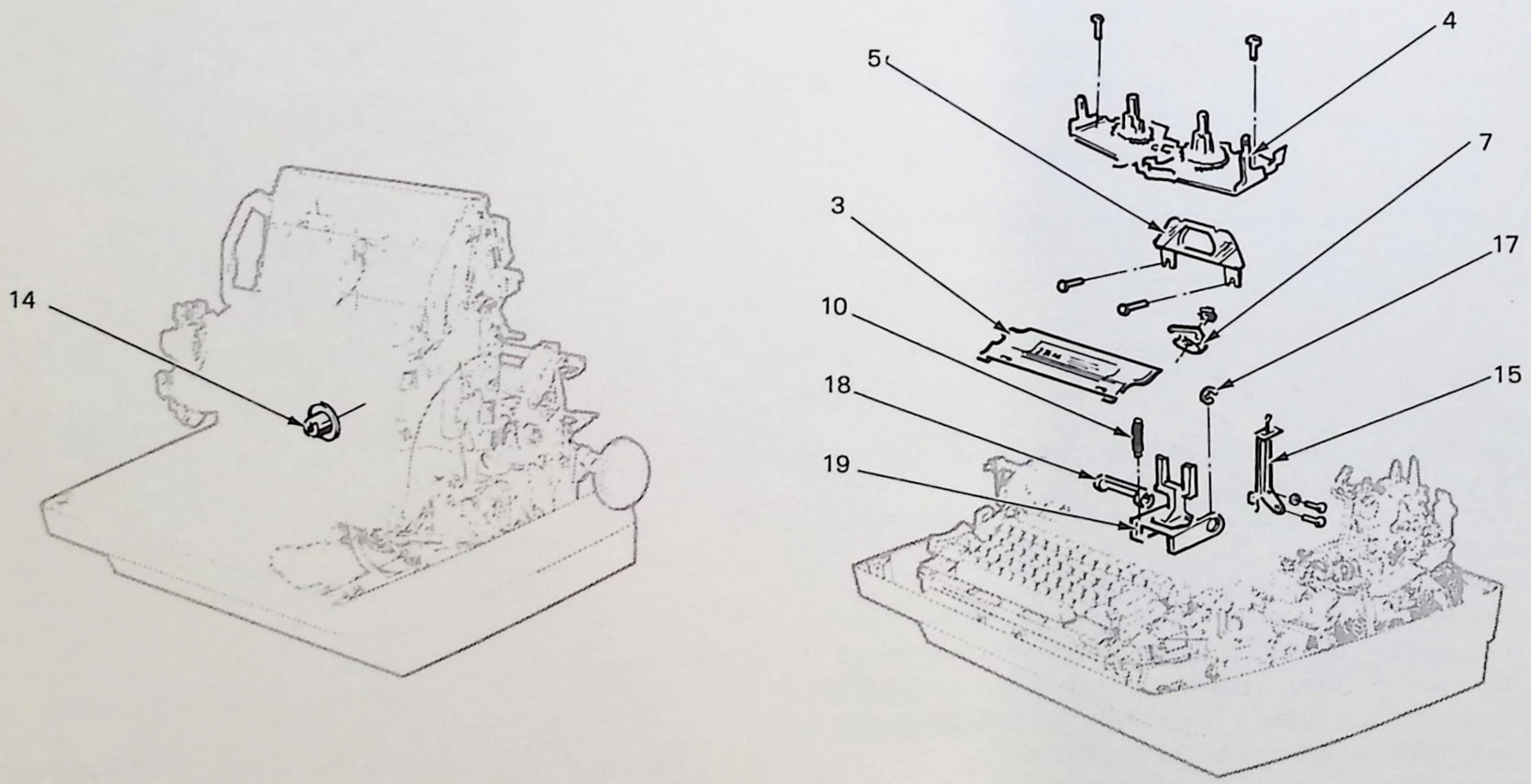


Figure 13 – Rocker Assembly Removal

SHIFT CAM REMOVAL

1. Perform cover removal.
2. Place machine in lower case.
3. Turn the typehead counterclockwise and remove the relaxed rotate tape from the shift pulley and put it around the tilt pulley. NOTE: On machines equipped with the stamped shift arm, it will be necessary to disconnect the rotate tape from the right side of the carrier.
4. Remove the shift detent spring and disconnect the shift interlock spring.
5. Remove the clip from the operational shaft and remove the shift clutch ratchet.
6. Disconnect the shift release link.
7. Remove the shift support bracket screw, shift support bracket, interlock and shift release lever as an assembly.
8. Remove shift cam follower (loosen screw at bottom).
9. Remove the detent arm.
   NOTE: On machines equipped with the Level 2 shift-to-print interlock, it will be necessary to disengage the shift interlock cable.
10. Remove the shift clutch spring (behind the ratchet).
11. Remove the shift clutch arbor.
12. Remove the shift cam.

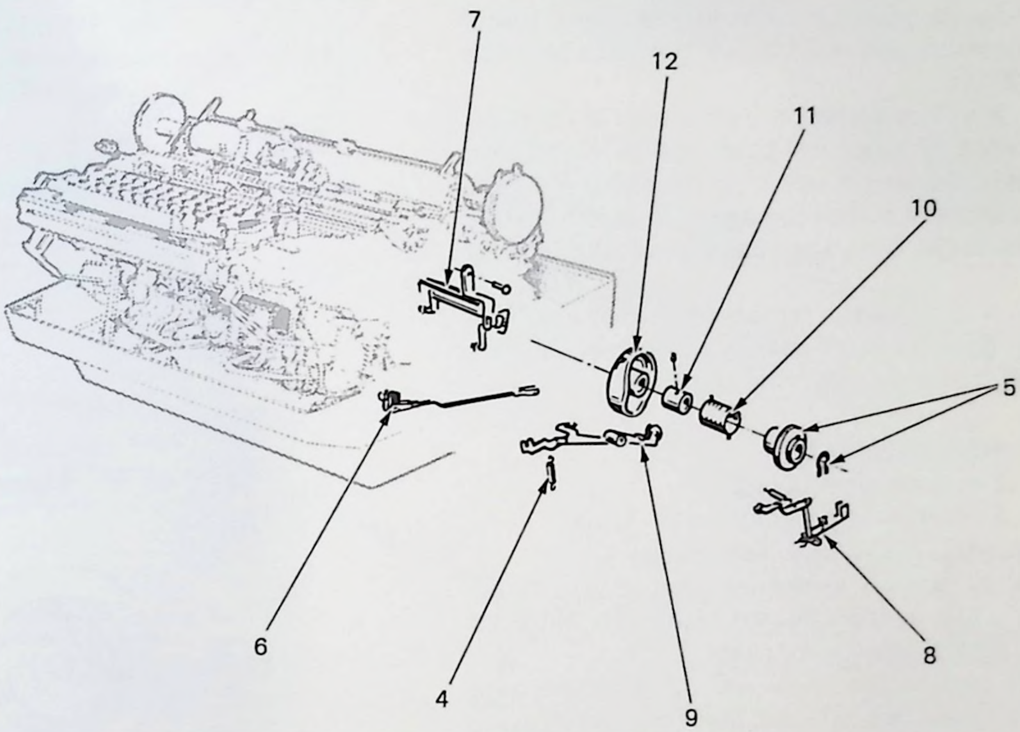


Figure 14 – Shift Cam Removal

SHIFT MAGNET ASSEMBLY REMOVAL

1. Perform cover removal.
2. Remove the spring from the lower case magnet armature.
3. Loosen front mounting stud.
4. Loosen rear mounting screw.
5. Unhook interlock cable and remove assembly.

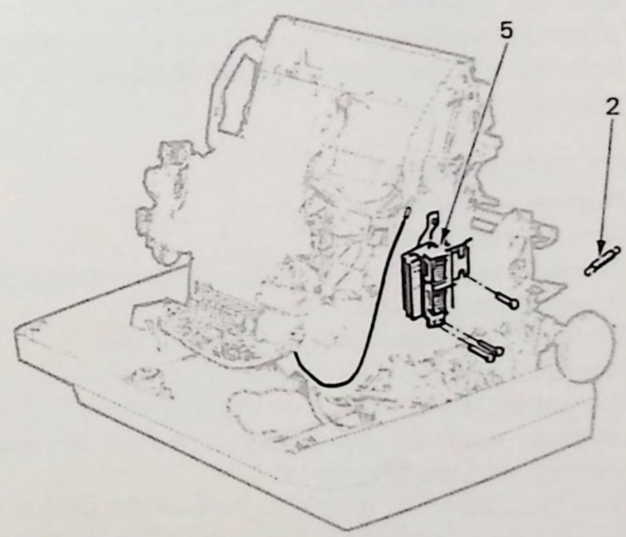


Figure 15 – Shift Magnet Assembly Removal

ROTATE TAPE REPLACEMENT

1. Perform cover removal.
2. Remove dust shields.
3. Position carrier approximately 6 inches from left side frame.
4. Half cycle a zero rotate tilt two character.
5. Withdraw the detents and, turning the typehead, wind up the rotate spring approximately 3½ turns or until the "T" slot is in the front of the rocker after the third turn. Allow the detents to restore.
6. Raise the tape anchor screw and install the rotate tape below the tilt tape.
7. Thread the tape around the shift arm pulley, under the carrier, under the carrier return cord, around the rotate arm pulley through the left end of the rocker pivot shaft, under the plastic guard on the tape guide, around the rotate pulley and insert the "T" end into the rotate pulley "T" slot.
   NOTE: It will be necessary to put a twist in the rotate tape between the rotate arm pulley and the rocker pivot shaft. Twist the tape so that when the rocker is in print position, the twist is at a maximum. The top of the tape should be to the front when coming out of the rocker shaft.
8. Pull shift arm to right to remove slack from tape then, hold the typehead and withdraw the detents, allowing the rotate spring to slowly wind up the tape.

TILT TAPE REPLACEMENT

1. Perform cover removal procedure.
2. Position carrier three inches from the left frame.
3. Half-cycle a zero rotate, zero tilt character.
4. Withdraw the detents, rotate the head counter clockwise one rotate position, tilt the head to the three tilt position, allow the detents to reseat.
5. Raise the tape anchor screw and install the tilt tape above the rotate tape. (Do not allow the rotate tape to relax).
6. Thread the tilt tape around the right tilt pulley, under the escapement bracket, and around the left tilt arm pulley.
7. Insert the tilt tape thru the left end of the rocker pivot shaft and install the tilt tape on the tilt bellcrank.
8. Hold the typehead, withdraw the detents and slowly allow the typehead to return to home, while ensuring both the tilt and rotate tapes are positioned on their respective pulleys.

CORD REPLACEMENT

1. Perform cover removal.
2. Remove dust shields.
3. Remove both cords and hand cycle the machine until the mainspring tension is relaxed.
4. Disconnect the carrier return unlatching link.
5. Manually latch the carrier return mechanism and rotate the turning wheel, while counting escapement shaft revolutions, until the mainspring is wound the proper numbers of turns. (Figure 18)
6. With the carrier to the right, connect the cord to the carrier return cord drum, position cord to the left over the idler pulley, around the left rear corner pulley and connect to the carrier using scissor clamps or the pusher end of a spring hook. (Figure 16)
7. Hold the slack out of the carrier return cord and rotate the turning wheel until the carrier approaches the left sideframe. Stop hand cycling when the notch in the escapement cord drum is visible.
8. Connect the escapement cord to the escapement cord drum and wrap, approximately one turn of the cord around the drum. (Figure 17)
9. Thread the cord around the cord tension pulley and connect it to the carrier.
10. Pull the carrier return cord over the left front corner pulley and connect the carrier return unlatching link.

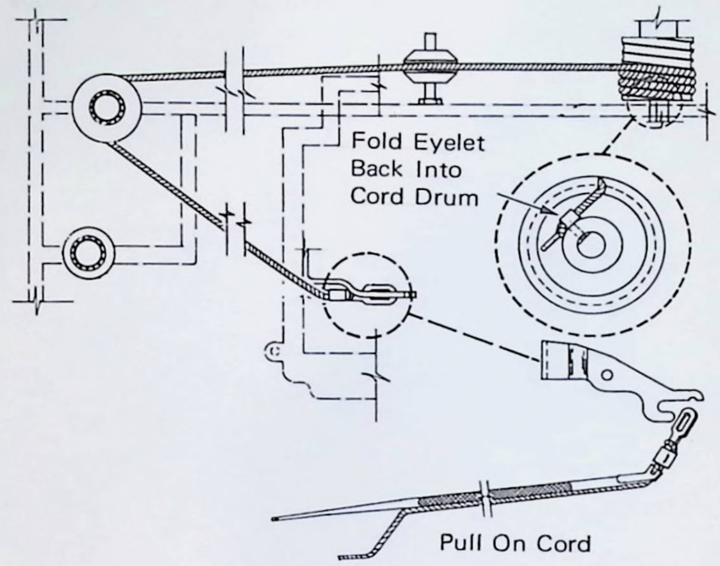


Figure 16

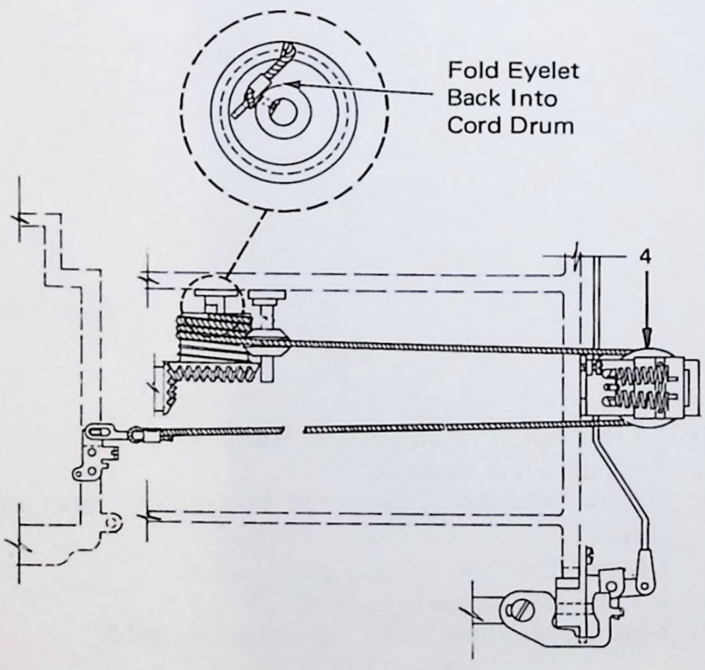


Figure 17

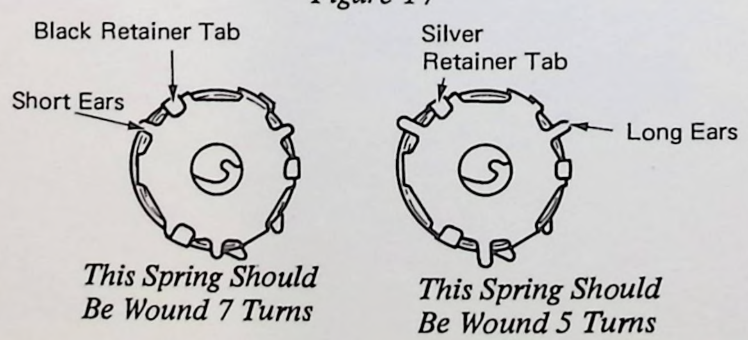


Figure 18

KEYBOARD INTERPOSER REMOVAL

1. Perform cover removal.
2. Position carrier to the right.
3. Remove margin rack assembly.
4. Remove margin release keylever.
5. Remove parts clamped to left end of bell ringer bail.
6. Remove bell ringer bail.
7. Disconnect operational keylever springs and repeat bail spring.
8. Remove spacebar mounting shaft.
9. Remove keylever upstop.
10. Slip the sound deadening material over the operational keybuttons and pivot the keylevers up out of the way.
11. Remove the C-clip from the left end of the interposer fulcrum rod and push the fulcrum rod to the interposer being removed, with a fulcrum rod tool.
12. Remove the spring from the interposer being removed and lift the interposer from the machine.

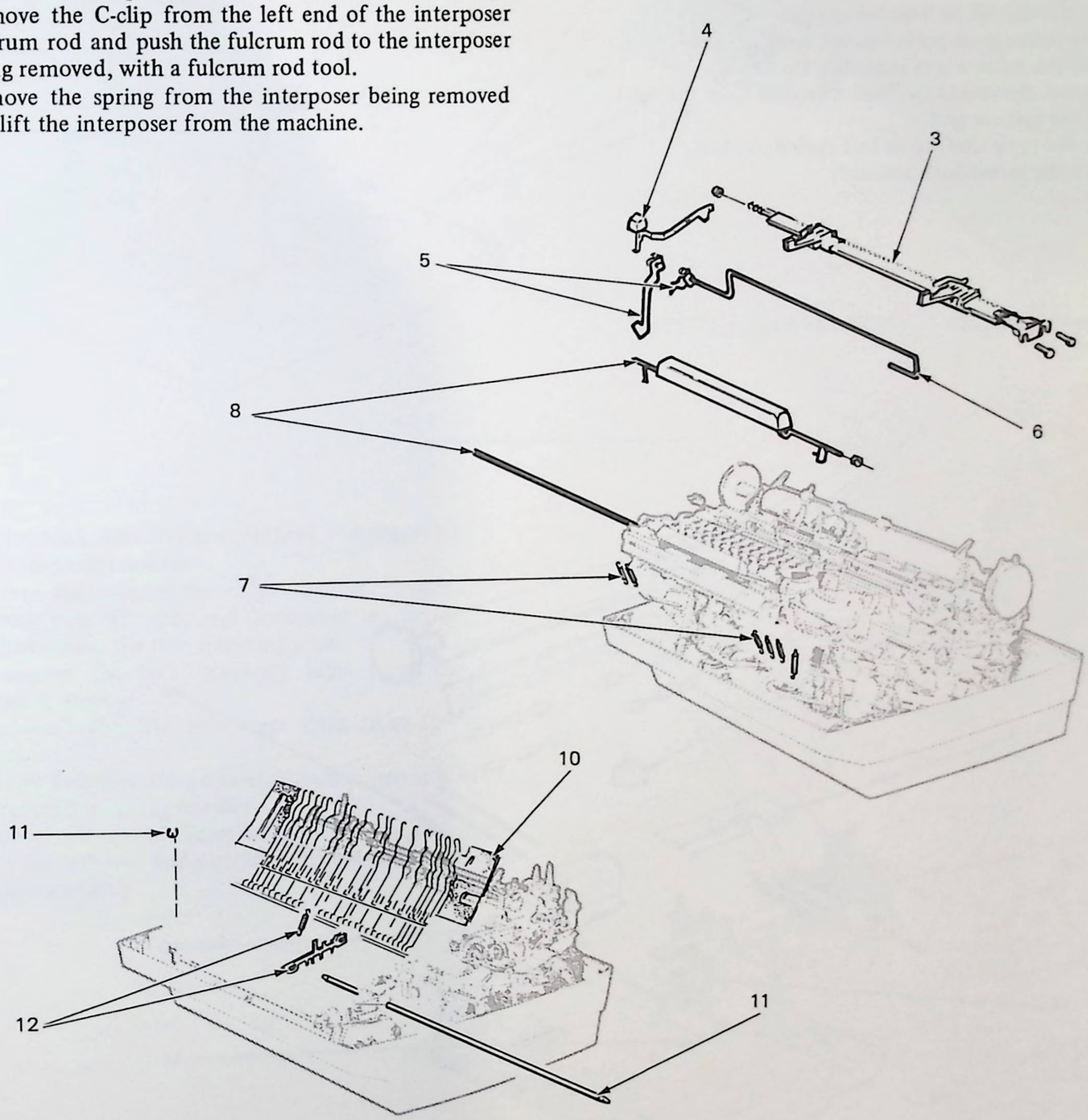
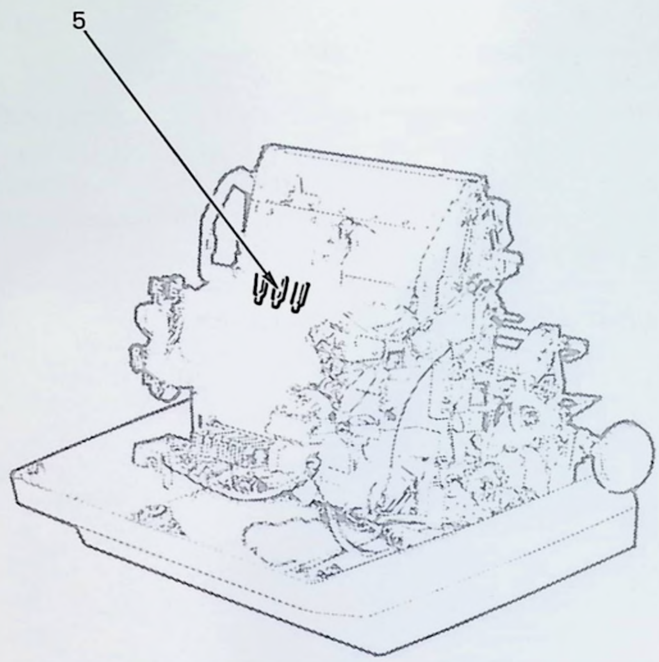


Figure 19 – Keyboard Interposer Removal

ROTATE SELECTION LATCH REMOVAL

1. Perform cover removal
2. Remove typehead
3. Position the carrier to the extreme right.
4. Remove the following; left dust shield, platen, feed rolls, and paper deflector.
5. Remove selector latch link clevises from the rotate latch links.
6. Remove motor.
7. Remove rotate latch springs.
8. Remove rotate latch links by pulling them to the rear out of the machine through the space previously occupied by the motor.
9. Disconnect the tilt differential spring.
10. Remove rotate latch guide bracket screws.
11. Remove the balance arm mounting stud.
12. Disconnect the minus five bail drive link from the right end of the balance arm.
13. Rotate the cycle shaft to its half cycled position.
14. Remove the rotate latch assembly.



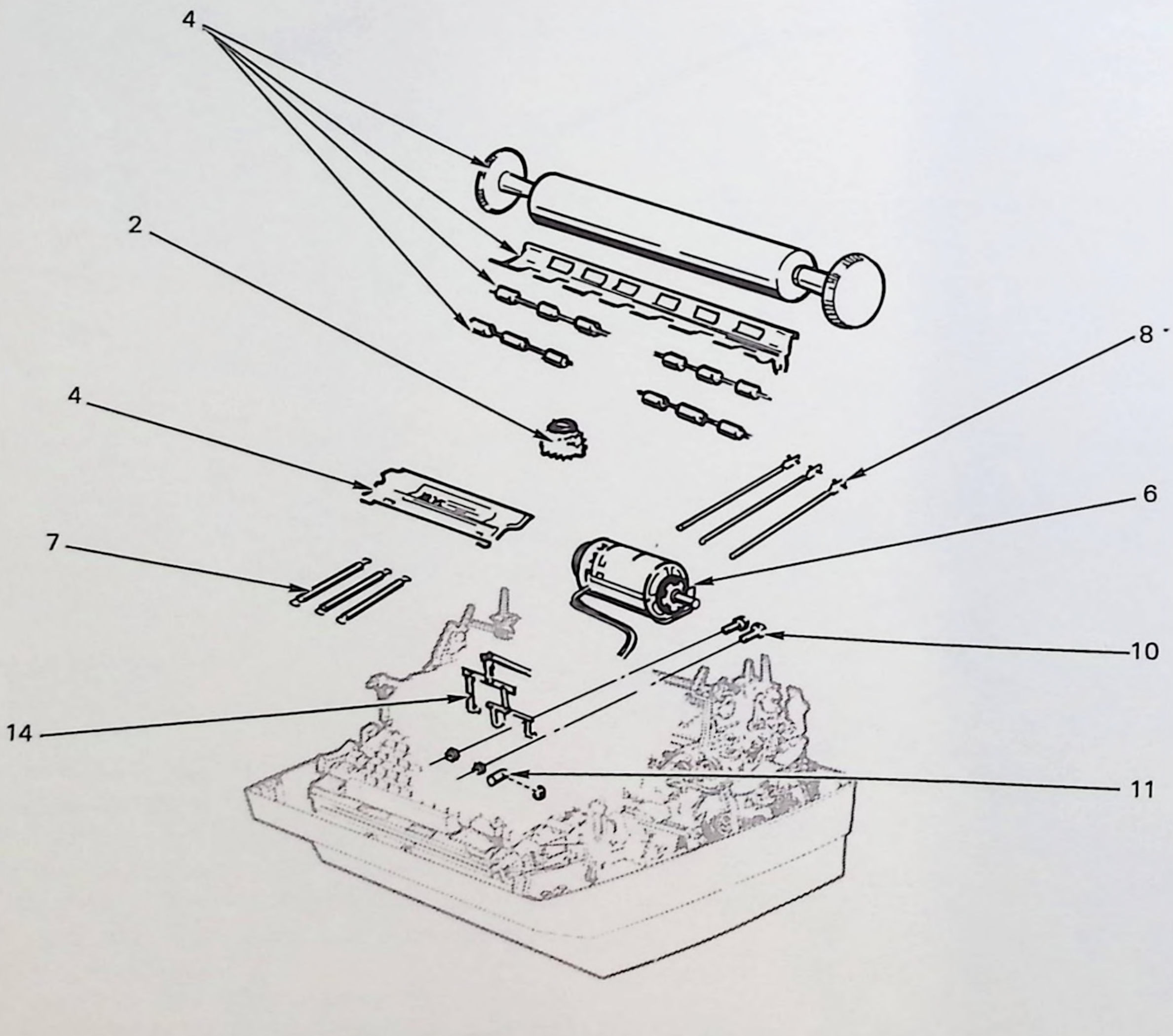


Figure 20 – Rotate Selection Latch Removal

SELECTION MAGNET ASSEMBLY REMOVAL

1. Perform cover removal.
2. Disconnect the cycle clutch trip link.
3. Remove the four mounting screws.
4. Remove the magnet assembly and disconnect the cable assembly leads.

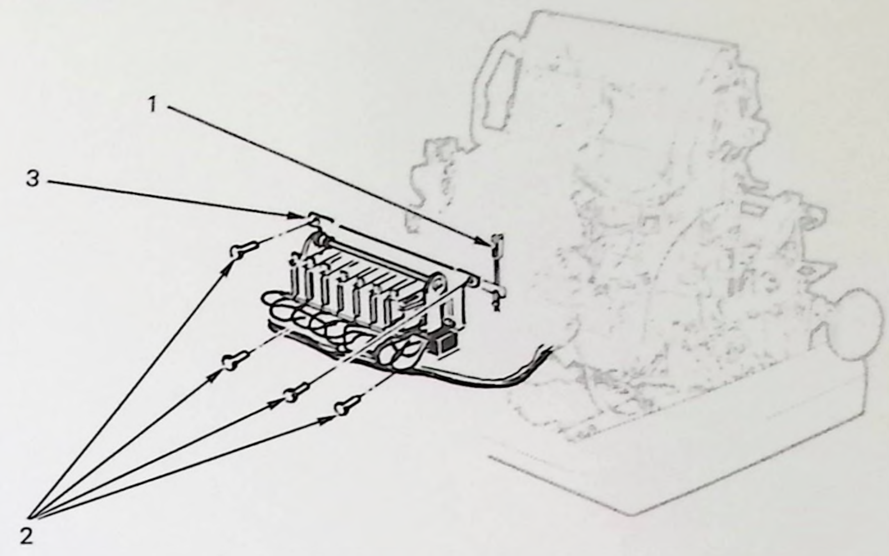


Figure 21 – Selection Magnet Assembly Removal

OPERATIONAL MAGNET ASSEMBLY REMOVAL

1. Perform cover removal.
2. Perform shift magnet assembly removal (731 only).
3. Remove two "C" clips and disconnect the two vertical flat links from the two actuating arms.
4. Disconnect the two operating links from the two actuating arms.
5. Disconnect the five interposer links from the interposers.
6. Remove two mounting screws from the right side of the operational magnet assembly.
7. Remove one mounting screw and one mounting nut from the left side and carefully remove the operational magnet assembly.

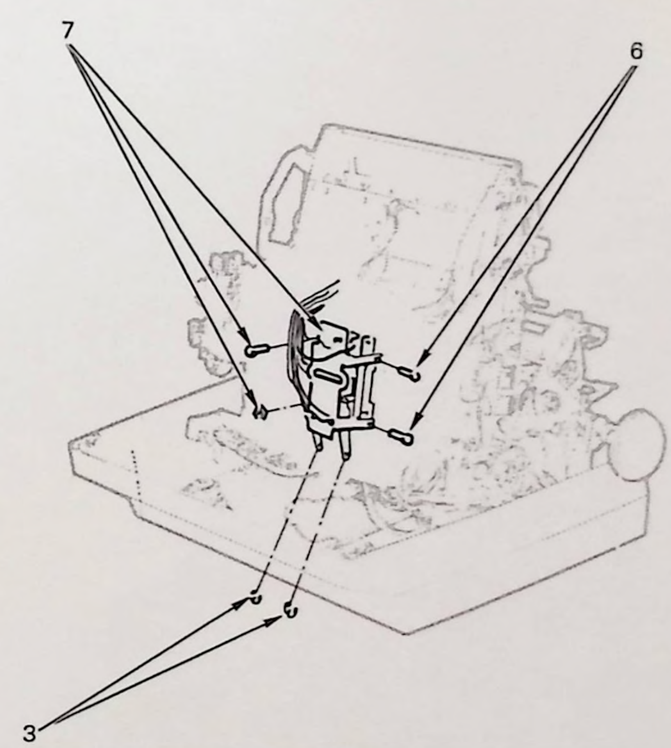


Figure 22 – Operational Magnet Assembly Removal
